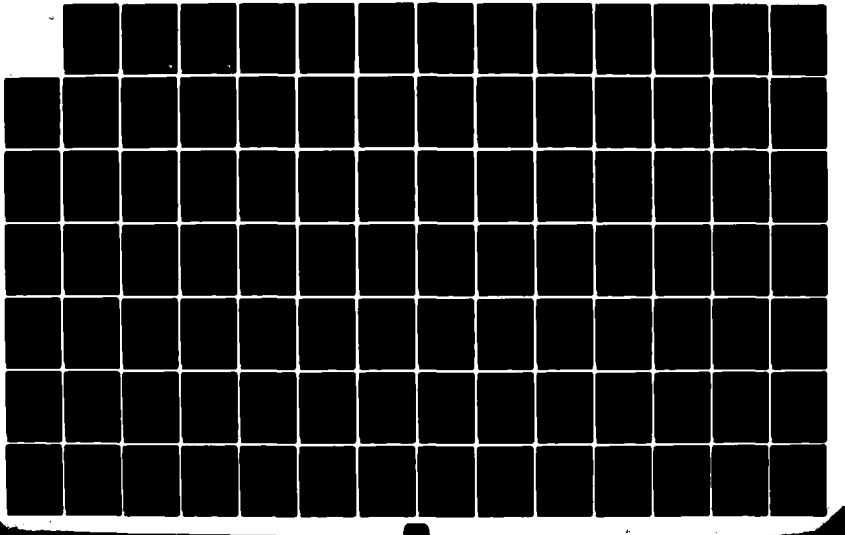
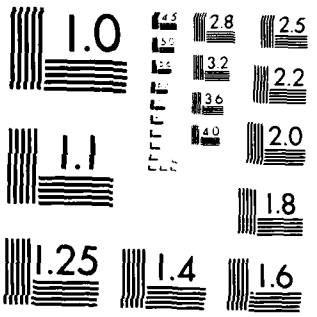
AD-A142 453 ESTIMATION OF CRITICAL POPULATION SUPPORT REQUIREMENTS 1/2
(U) ENGINEERING AND ECONOMICS RESEARCH INC VIENNA VA
R A CABRAAL ET AL. 30 MAY 84 EER-TR-008-84
UNCLASSIFIED EMW-83-R-1266 F/G 15/3 NL





TR-008-84

(12)

ESTIMATION OF CRITICAL POPULATION SUPPORT REQUIREMENTS

FINAL REPORT

CONTRACT NO. EMW-83-R-1266 (W.U. #4921H)

Submitted To:

FEDERAL EMERGENCY MANAGEMENT AGENCY
500 C Street, S.W., Room 716
Washington, D.C. 20472

By:

ENGINEERING AND ECONOMICS RESEARCH, INC.
1951 Kidwell Drive
Vienna, Virginia 22180
(703) 893-8600

May 30, 1984

TR-008-84

ESTIMATION OF CRITICAL POPULATION SUPPORT REQUIREMENTS

FINAL REPORT

CONTRACT NO. EMW-83-R-1266 (W.U. #4921H)

Submitted To:

FEDERAL EMERGENCY MANAGEMENT AGENCY
500 C Street, S.W., Room 716
Washington, D.C. 20472

By:

ENGINEERING AND ECONOMICS RESEARCH, INC.
1951 Kidwell Drive
Vienna, Virginia 22180
(703) 893-8600

May 30, 1984

Unclassified

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER TR-008-84	2. GOVT ACCESSION NO. AD-A142 453	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) Estimation of Critical Population Support Requirements		5. TYPE OF REPORT & PERIOD COVERED Final Report October 1983 to May 1984
		6. PERFORMING ORG. REPORT NUMBER TR-008-84
7. AUTHOR(s) R. A. Cabraal, A. S. Dhaliwal, E. Faby		8. CONTRACT OR GRANT NUMBER(s) EMW-83-R-1266
9. PERFORMING ORGANIZATION NAME AND ADDRESS Engineering and Economics Research, Inc. 1951 Kidwell Drive, Vienna, VA 22180		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS W.U. 4921H
11. CONTROLLING OFFICE NAME AND ADDRESS Federal Emergency Management Agency Industrial Protection Program 500 C Street, Washington, D.C. 20472		12. REPORT DATE May 30, 1984 13. NUMBER OF PAGES 133
14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office)		15. SECURITY CLASS. (of this report) Unclassified 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; distribution unlimited

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Industrial Protection, Emergency Food Distribution, Population Support Requirements, Food Production and Processing, Regional Food Supply, Post-Attack Planning

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This study evaluates the feasibility, costs and benefits of implementing a regionally self-sufficient system for food distribution in the event of a national emergency. A methodology for this evaluation assesses the feasibility of supporting the population of a region from the items produced within the region with minimum amount of outside help. The procedure used is a linear programming model which determines optimal regional monthly food production and consumption mix with minimum inter-regional flows. The consumption mix is

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE

Unclassified

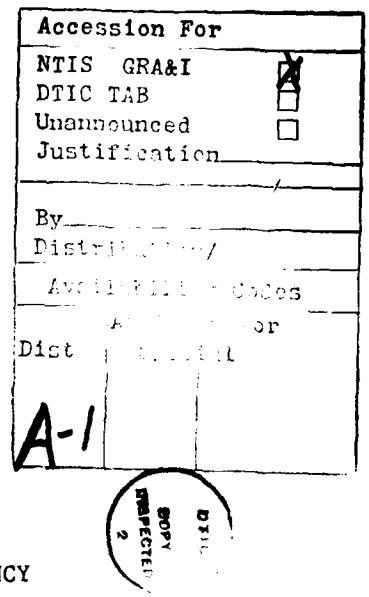
SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

selected by the model from different food commodities produced in the region in supplying nutrients for the population. The results of the analysis indicate that most of the regions can meet the food demand themselves with little or no outside help. Inter-regional transportations of food commodities is reduced compared to that in peacetime. The average diet calculated by the model meets the nutritional standards with a smaller quantity of food than the diet recommended by the USDA emergency allowance or peacetime consumption. This strategy is most applicable in a post-attack situation; implementation difficulties may preclude its use in pre-attack situations.

Approved for public release; distribution unlimited.

TR-008-84

"This report has been reviewed in the Federal Emergency Management Agency and approved for publication. Approval does not signify that the contents necessarily reflect the views and policies of the Federal Emergency Management Agency"



(Detachable Summary)
ESTIMATION OF
CRITICAL POPULATION SUPPORT
REQUIREMENTS

FINAL REPORT

CONTRACT NO. EMW-83-R-1266
(W.U. # 4921H)

Submitted To:

FEDERAL EMERGENCY MANAGEMENT AGENCY
500 C Street, S.W., Room 716
Washington, D.C. 20472
Attn: Mr. Thomas Provenzano

By:

ENGINEERING AND ECONOMICS RESEARCH, INC.
1951 Kidwell Drive
Vienna, Virginia 22180
(703)893-8600

MAY 30, 1984

EXECUTIVE SUMMARY

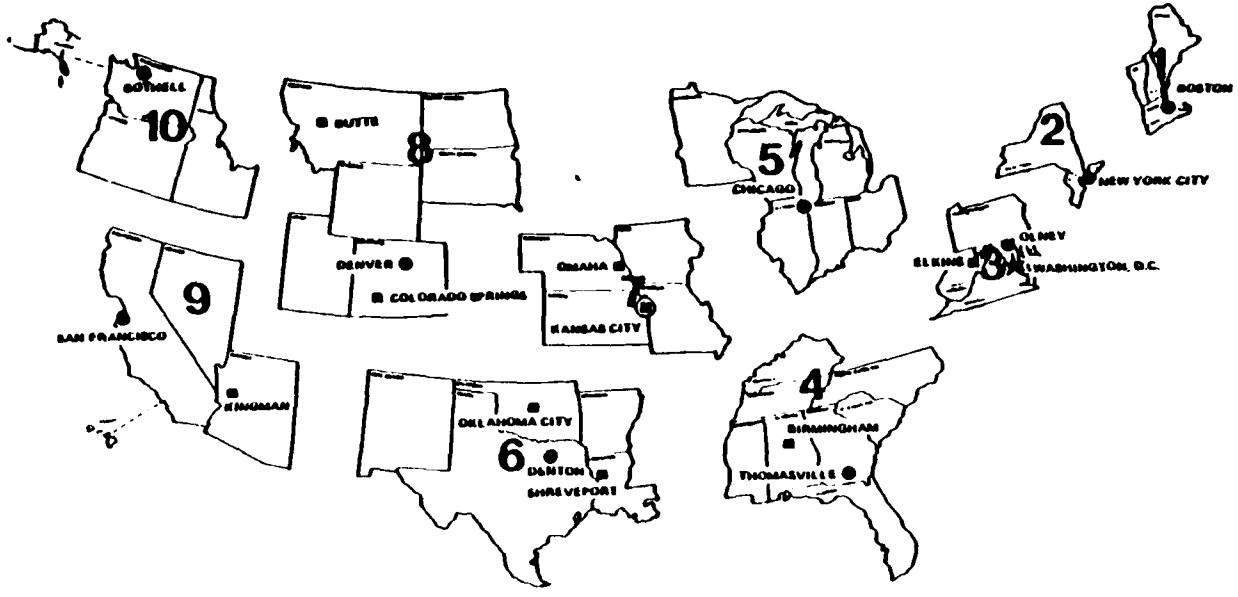
Introduction

This study by Engineering and Economics Research, (EER) Incorporated evaluates the feasibility a regionally self-sufficient system for providing essential population support in the event of a national security emergency. This analysis supports the development of the Protection of Industrial Capability (PIC) Program by the Federal Emergency Management Agency (FEMA). The PIC program is designed to ensure the availability of industrial production required to support the population, maintain defense capabilities and perform command and control activities during a national emergency, such as, a nuclear attack. Hence, one objective of the PIC program is to protect key industrial workers and facilities. The premise behind this analysis was that a regionally self-sufficient population support plan would reduce transport-related requirements for manpower, facilities, and other resources in both pre- and post-disaster periods, and also enhance the survivability of the population in the post-disaster period.

A methodology was developed to assess the feasibility of supporting the population of a region from items produced within that region. The regions considered in the analysis were the ten FEMA regions in the continential US (Exhibit I). Interregional imports would occur only as needed to meet minimal population support requirements in each region. Food was the only critical population support requirement considered in the study, because of the short-term substitutability of one food product for another and the year-round regional availability of foodstuffs. The methodology used

EXHIBIT 1

THE FEMA REGIONS



a linear programming (LP) model which determined the optimal regional monthly food production and consumption mix needed to minimize inter-regional food flows. The model operated on a monthly basis (i.e. optimal production and consumption mix was calculated for each month, without examining the cumulative effects a regional system would create for more than one month).

In order to satisfy the nutritional needs of the population, the model selected commodities from six different food groups (processed grain, baked goods, fresh fruits and vegetables, processed fruits and vegetables, meat and dairy products). Eight types of nutrients (energy, protein, carbohydrates, Vitamin C, riboflavin, niacin, thiamin and calcium) had to be provided. The model provided for raw food input to the food processing sectors in each region from either production, inventories of the agricultural production sector or imports of commodities (grain, meat, milk, fruits and vegetables) from other regions. Exhibit II shows an overview of the modeled food supply and demand system. The model generates monthly optimal production processing and consumption patterns for each region.

Conclusions

The principal conclusions drawn from the analysis are as follows:

- The results of the LP analysis for all the 10 regions indicate that only regions 8, 9, and 10 can meet the demand for food from the sources available within the regions no matter what month the analysis was conducted for. In other words, no imports are required to meet minimal nutritional demands in these regions.

- Regions 1 through 7 require imports of one or more commodities for either part or all of the year. Details are shown in Exhibit III. In particular:

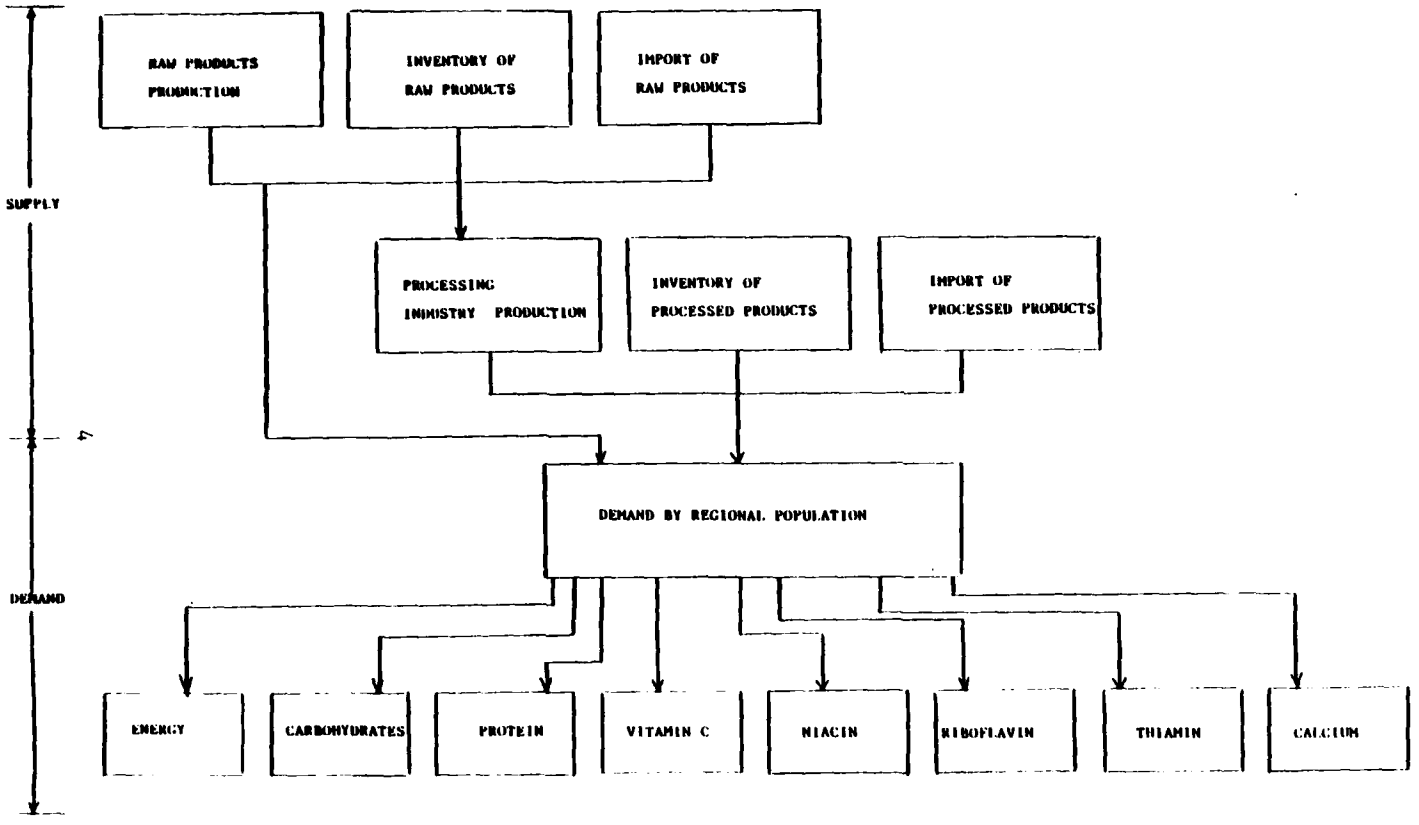


EXHIBIT II OVERVIEW OF MODEL

EXHIBIT III Summary of Supply-Demand Analysis Results

Commodity	Regions Requiring Imports	Period when Imports are Required	QUANTITY IMPORTED Minimum (Million lbs.)	Maximum (Million lbs.)	Average (Million lbs.)	Annual (Million lbs.)	Per Capita (lbs/Person-Year
1. Grains	None	None	0	0	0	0	0.0
2. Milk	None	None	0	0	0	0	0.0
3. Fresh Fruit/Veg	2	Mar-June	101 (Feb)	228 (May)	171	684	27.3
	3	Mar-June	19 (June)	242 (May)	153	612	25.4
	4	Jan-Mar & Aug-Dec	1 (July)	255 (March)	148	1335	33.2
	5	May	204 (May)	204 (May)	204	204	4.5
	6	Jan-Dec	9 (May)	313 (Jan)	187	2266	84.7
	7	Feb-Aug & Nov	4 (Nov)	147 (May)	77	616	52.0
4. Meat	None	None	0	0	0	0	0.0
5. Processed Grain Products	None	None	0	0	0	0	0.0
6. Baked Goods	1	Jan-Dec	79 (Jan-Dec)	79 (Jan-Dec)	79	948	75.9
7. Processed Meats	None	None	0	0	0	0	0
8. Dairy Products	1	Jan-Dec	17 (April)	55 (Nov)	40	480	38.4
	4	Jan-Dec	44 (April)	146 (Nov)	107	1284	32.0
	6	Jan-Dec.	25 (March)	129 (Nov)	81	972	36.7
9. Processed Fruit/ Vegatables	None	None	0	0	0	0	0.0

import minimizing scenario indicate that in the latter case shipments are only about 20 percent of the peacetime shipments. This shows that transportation requirements will be reduced drastically in the regional self-sufficiency scenario. Principal reductions occured in grain shipments and fruits and vegetable shipments. (See Exhibit IV for more details). This should reduce risk area production requirements for all industries supporting the transportation sectors (e.g. fuel, spare parts, etc.)

- Comparison of the consumption patterns calculated by the model with peacetime and USDA Maximum Emergency and Allowance consumption (the diet used in current FEMA emergency planning guidelines) indicates that for the nation as a whole, average annual total per capita consumption is approximately fifteen percent lower in the regional self-sufficiency scenario than the corresponding peacetime consumption and six percent lower than the corresponding USDA Emergency Allowance Value (Exhibit V).

- There are significant regional variations in the diet an n the total amount of food consumed per person in the regi self-sufficiency scenario. On the average, Region 10 ha ıe highest per capita consumption (36 percent greater peacetime) and Region 7 has the lowest per capita consum (30 percent less than peacetime). (See Exhibit VI).

Policy Implications

There are a number of policy implications that can be drawn from the results of the study, which indicate that food transportation requirements would be drastically reduced under a regional sufficiency scenario. In addition, capacity utilization of the food processing industries is generally considerably less than 100 percent except for grain milling capacity. These results imply reduced blast shelter requirements. Thus, savings on blast shelter construction could be realized and potentially fewer workers would be exposed to high risk. Another advantage of the system is that it would facilitate coordination of consumption requirements with production. While additional planning would be required for the regional system to work, this system would provide adequate nutrition with minimum

EXHIBIT IV

COMPARISON OF LP MODEL ANALYSIS RESULTS AND PEACETIME INTER-REGIONAL COMMODITY FLOWS

(Million Pounds)

	Meat SIC=201	% of Total	Dairy Products SIC=202	% of Total	Fruits/Veg SIC=203	% of Total	Grain Mill Products SIC=204	% of Total	Baked Goods SIC=205	% of Total	Total
Total Shipments by LP Analysis	0	0	2736	30	5695	60	0	0	948	10	9399
Shipments based on 1977 Inter-regional Commodity Flow Data	9825	22	4466	10	9403	21	18712	40	2619	6	45025

EXHIBIT V

Range Of Consumption Of Commodities In The Regional Model Compared To Peacetime And The USDA Emergency Allowance Consumption

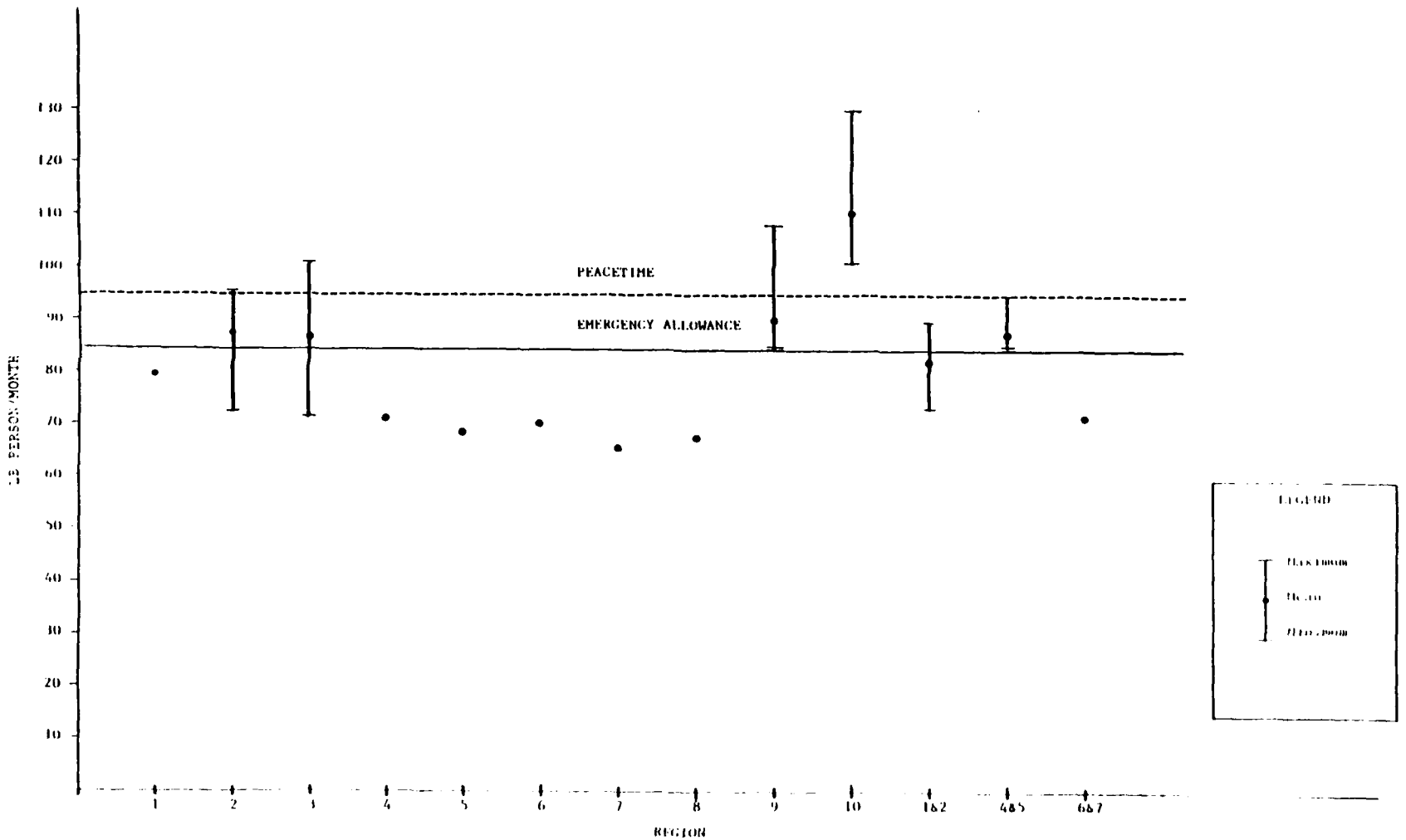
(lb/person/year)

	Regional Model			USDA Emergency Allowance	Peacetime
	Average	Maximum	Minimum		
Fruit/Vegetables	254	345	198	315	425
Bakery/Grain	221	301	142	208	150
Dairy	263	491	198	411	264
Meat	216	319	119	181	286
Total Consumption	954	1337	792	1011	1126

EXHIBIT VI

RANGES OF REGIONAL MONTHLY PER CAPITA CONSUMPTION

COMPARED TO MONTHLY PEACETIME AND EMERGENCY ALLOWANCE CONSUMPTION



transportation than would the alternative "business as usual"/USDA Emergency Allowance alternative. In addition, the regional strategy would provide several advantages in a post-attack environment, when there would be major disruptions in long distance transportation networks because of damage to equipment, roads, communication systems, etc. Planning requirements for a regional system would include identification of resources on a regional basis to meet the nutritional demand with lower consumption and reduced transportation. This would increase the probability of survival of larger portions of the population.

On the other hand, there are a number of difficulties associated with the regional food distribution system. First, this system would require a major reorganization of the food system network. A lot of planning and coordination would be required to redirect shipments to alternative destinations. Second, production and processing would have to be adjusted in regions that normally export substantial quantities of food (e.g., California) to other regions, which may cause economic disruption as well. Third, the regional system, as developed in our model, could result in depletion of inventories and cause food shortages in the long term. Because our model does not link together production and consumption from one month to the next, the magnitude and location of inventory depletion are difficult to determine. However, development of a larger model in which monthly data were analyzed sequentially and regions were linked together would generate the needed information.

Finally, planning and implementing a regional system depends on industry cooperation and relative weighting of costs and benefits of this system. Food industry personnel are expected to support this system as they favor continuing operation of warehouses in high risk area rather than trying to shift warehousing activities to lower risk areas. An analysis should be conducted for industry cooperation in formulating a plan for a regionalized food system.

Recommendation

It is recommended that a national model linking together all regions and months be developed, so that a truer representation of the food supply and demand system is available for conducting further strategy evaluation. Such a model would be substantially larger than the model used in this analysis. In order to implement such a model, suitable information management and database systems are required. EER recommends the following steps to improve the existing systems:

- Set up a formal data communication system between FEMA and other agencies to coordinate timely data collection, thereby improving data consistency, accuracy and completeness.
- An integrated food commodity database should be established. The data could be collected for 4 digit SIC level industries and could be characterized by a product code, month, year, region/status codes, data source and data category (e.g., production or stocks).
- Procedures for regular update of the databases should be established.
- A forecasting system for estimating future product availability should be implemented. An optimal resource allocation procedure should be designed and integrated with the database management and the forecasting system. This procedure would be an extension of the model used in this analysis. A more comprehensive model may include the products considered at the 4 digit SIC level.

TABLE OF CONTENTS

LIST OF EXHIBITS

LIST OF EXHIBITS (continued)

1.0 INTRODUCTION

1.1 Purpose and Objectives

This report presents the results of a study conducted by Engineering and Economics Research (EER), Inc. for FEMA as part of the development of the Protection of Industrial Capacity (PIC) Program. The study assists in evaluating the feasibility, costs and benefits of implementing a regionally self-sufficient system for providing essential population support requirements.

The objectives of the PIC Program are to ensure the availability of industrial production required to support the population, maintain national defense capabilities and perform command and control activities during a national emergency such as a threat of a nuclear attack. Hence, one objective of the PIC program is to protect key industrial workers and facilities. An essential element to protect key industrial workers is the Key Worker Blast Shelter (KWBS) program. In a companion study (Contract #EMW-C-0924), under the KWBS program, EER has developed and demonstrated a methodology to estimate the number of key workers and blast shelter spaces required to produce critical requirements during a crisis relocation period.* In that study, we developed and utilized a set of critical population support requirements based upon FEMA guidelines and some additional assumptions to minimize shelter requirements. In this study, our

---

* Methods and Procedures To Specify Key-Worker Blast Shelter (KWBS) Location and Requirements, Final Report, Engineering and Economics Research, April 1984. Prepared for Federal Emergency Management Agency, Industrial Protection Program.

objective was to evaluate the impact on key worker and blast shelter requirements of an alternative scenario of population support requirements.

The scenario and methodology for this evaluation were developed to assess the feasibility of supporting the population of a region from items produced within that region. Inter-regional imports and exports would occur only as needed to meet minimal population support requirements in each region. A distinct feature of the analysis was selecting a food mix to satisfy a set of minimum nutritional requirements using food commodities available within the region. This should be contrasted with the previously referenced EER study which required the provision of the USDA National Emergency Maximum Food Distribution Allowance to the population.

There are two possible advantages to a regional production and distribution system of this type. First, it is likely that transportation requirements would be lower for a regional system than for the current national system. Therefore, requirements for equipment, personnel, and fuel would also be lower. With a reduced consumption of food, associated requirements such as packaging would also be reduced. These reductions in transportation and other requirements will reduce blast shelter requirements. Second, since these regions would be more self-sufficient, the probability of survival of larger portions of the population would increase. This study assists in evaluating the feasibility, costs, and benefits of implementing a regional system under emergency conditions.

1.2 Scope

Critical population support requirements include food, water, medical supplies, energy, and transportation. Each of these requirements was assessed in the context of a regional supply system to determine preliminarily if a regional supply system would be feasible. Food appeared to be ideally suited to a regional analysis, because it is produced virtually everywhere and food commodities can be easily interchanged while maintaining adequate levels of nutrition. An additional consideration in the decision to focus on food requirements was the availability of well defined nutritional requirements and data on production and inventories of food commodities.

Water, medical supplies, energy, and transportation were judged to be inappropriate for a regional short-term product substitutability feasiability analysis. The principal reasons being the unavailability of regional data for water and medical supplies availability and the lack of short-term substituability among products and services included under medical supplies, energy, and transportation.

It was assumed in the analysis that the duration of the crisis is thirty days or less. However, nutrients requirements were based on the scenario to cover an emergency of up to 8 weeks. A single set of nutritional requirements for adults and children was used. The reason was minimum requirements for children were not specified. Moreover, children under 12 years, constitute less than 10 percent of 1982 U.S. population. It was also assumed that agricultural production and food processing capabilities were those normally

available during peacetime. Other assumptions used in assembling data for the LP model are discussed in appendix B.

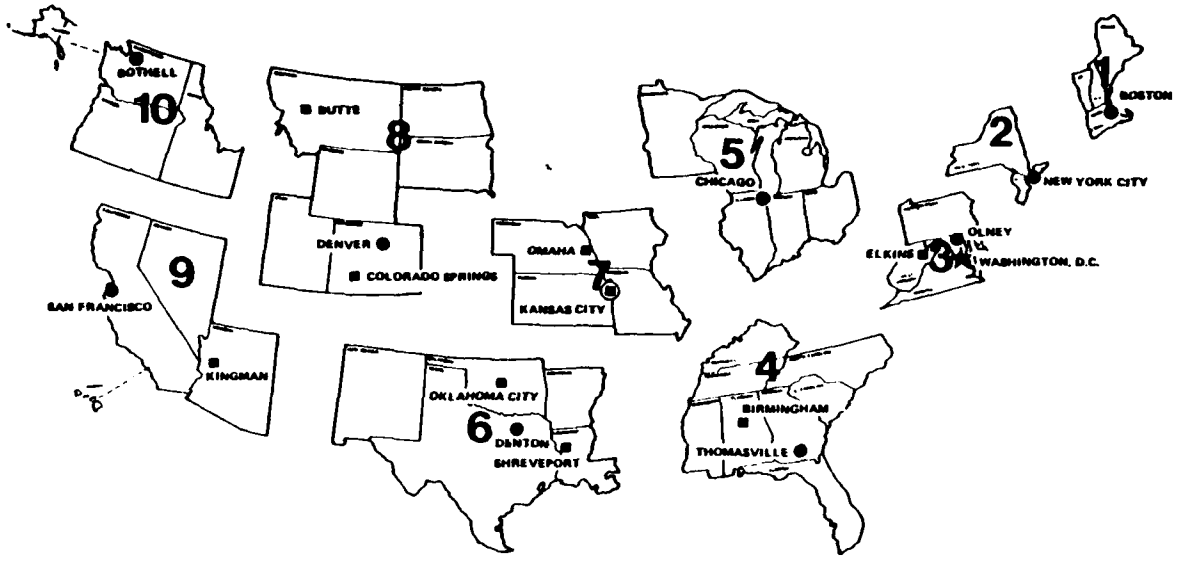
The methodology developed for this study utilizes a linear programming (LP) model to analyze food production and processing, independently for each region and each month. The methodology is described in Section 2.2. The regions used correspond to the ten FEMA regions; these are shown in Exhibit 1-1. Our analysis focussed on the continental United States only. Because the data were aggregated for use in the LP model, the results did not provide detailed information on commodities (it did not distinguish between wheat and corn, for example) or on intra-regional commodity flows.

1.3 Report Organization

The following sections of this report describe the study and present the results. Section 2 presents the methodology in detail and describes the alternative assumptions, those of the FEMA guidelines, the Key Worker Blast Shelter study, and this study. This section also briefly describes the data and data sources used in the study. Section 3 presents an overview of the results for individual regions and highlights the difficulties for some regions in supplying the requirements without imports from other regions. This discussion identifies critical commodities, critical months, reasons for import requirements, and the effect of relaxing the restriction on imports into the region by allowing imports from adjacent regions. Section 4 presents a comparison between this study and the other scenarios of per capita consumption of foods within the major food groups (meat, dairy, grains, fruits and vegetables). It also presents a comparison

EXHIBIT 1-1

THE FEMA REGIONS



of total inter-regional shipments for the regional system with historical, peacetime shipments. Section 5 concludes the report with a discussion of the policy and planning implications of a regional food production and distribution system.

2.0 BACKGROUND AND METHODOLOGY

In order to provide a meaningful evaluation of the impact of a regional food production and distribution system, consumption under this scenario was compared to consumption corresponding to the FEMA guidelines and that corresponding to the assumptions of the Key Worker Blast Shelter (KWBS) study. This section describes the scenario used for this study and the two alternative scenarios which provided the basis for comparisons and evaluation of our results. In addition, a detailed description of the methodology is provided. The section concludes with a description of the data and sources used.

2.1 Alternative Guidelines for Food Production and Distribution

Current FEMA guidelines for food system support of the population during crisis relocation recommend mimimal changes in the current production, processing and wholesale distribution system. In host areas, food production, processing, wholesale and retail activities would continue at pre-crisis levels or expand when possible. In risk areas, most production and processing would be continued; wholesalers would redirect food and non-food items which meet the national emergency standards from retail destinations in risk areas to supermarkets and food distribution points in host areas. Since the guidelines recommend continuation of normal pre-crisis production, processing, and wholesaling activities, current levels of regional interdependence, e.g. imports and exports, would still be required. Increased distances to retail stores would increase transportation requirements, resulting in a need for more trucks, drivers, and fuel.

An alternative scenario used by EER in the KWBS study prescribed that food shipments and rations correspond to the USDA National Maximum Emergency Food Distribution Allowance. This allowance, shown in Exhibit 2-1, differs from normal consumption in the mix of foods provided; it provides more grain products and less meat and vegetables than are normally consumed. The allowance also gives acceptable substitutes for the foods on the list. The similarities between this allowance and the normal consumption pattern are cited as advantages of this allowance, because a nearly normal diet would help to sustain morale during a crisis.* Total per capita consumption under this allowance is nearly equivalent to total peacetime per capita consumption. While the current FEMA guidelines do prescribe distribution to consumers consistent with the USDA Emergency Allowance, the guidelines for food production and transportation do not indicate measures to shift significantly from the normal peacetime mix of foods to that corresponding to the USDA Emergency Allowance. For this reason, the current FEMA guidelines effectively provide for consumption which is equivalent to normal peacetime consumption. In contrast, the KWBS study scenario explicitly used the USDA Emergency Allowance to calculate direct and indirect production requirements and KWBS requirements.

The analysis for this study was based on an alternative set of standards. Minimum nutritional requirements rather than quantities for specific food commodities were used.

---

* J.W. Billheimer et al. Food System Support of the Relocation Strategy, Volume III: Planning Guidelines, Defense Civil Preparedness Agency CPG-2-8-2 September 1975.

EXHIBIT 2-1
USDA NATIONAL EMERGENCY MAXIMUM FOOD DISTRIBUTION ALLOWANCE*

Code Of Emergency Federal Regulations - October 1, 1976

Table 1 - Food Allowance per Person Per Week

Food Groups and Food Items	Amt. Per Week
Meat and Meat Alternates	
(Fresh, frozen, and cured meat, poultry, fish, shellfish; cheese; and nuts)	3 lbs. boneless 4 lbs bone in
Eggs	6 eggs
Milk (Fresh Fluid)	(not limited by this suborder)**
Cereals and Cereal Products	
(Flour including mixes, fresh bakery products, corn meal, rice, hominy, macaroni, and breakfast cereals)	4 lbs.
Fruits and Vegetables	
Frozen	2 lbs.
Food Fats and Oils	
(Butter, margarine, lard, shortening, salad and cooking oils)	1/2 lb.
Potatoes (white and sweet)	2 lbs.
Sugars, Syrups, Honey & Other Sweets	1/2 lb.

* John W. Billheimer and Arthur W. Simpson, Effects Of Attack On Food Distribution To The Relocated Population, Volume II: Revised Planning Guideline Rs-2-8-28, April 1979. For Defense Civil Preparedness Agency.

** For this study, the value 7 pints was used for the allowance of milk. This value was obtained from the National Emergency Food Consumption Standard which was the emergency standard preceding the National Emergency Maximum Food Distribution Allowance. The two standards are identical except for the allowances for milk and vegetables.

There are two possible advantages of using the minimum nutritional requirements. First, total consumption could be reduced; and second, these requirements would allow more flexibility in providing different mixes of food.

Preliminary runs of the linear programming model yielded results in which the mix of foods to be provided was radically different from normal consumption. For example, in some cases the diet consisted of only meats and grain products. We judged that this type of unbalanced diet would be unacceptable to most people. As a result, we added additional constraints to the linear programming formulation to require that the mix of foods to be provided should more closely resemble normal consumption patterns while retaining some flexibility. A number of alternatives were considered in developing the "minimum imports" strategy, which included the following:

- Use only regional production and processing capacities and product inventories
- Relax slightly the balanced diet restriction
- Increase processing capacities by allowing two and three operating shifts per day
- Allow imports between adjacent regions

The nutritional requirements used are described in Section 2.3. The comparison of consumption patterns under this scenario to those of the alternative scenarios is presented in Section 4.

2.2 Analytical Methodology

The objective of the analysis was to determine regional food commodity production, processing and consumption patterns that minimize imports. A linear programming (LP) model which allowed the

optimal regional monthly production and consumption mix of food to be determined was developed and used in the analysis. This model was a combination of a capacity constrained, single period food sector inter-industry model and a diet formulation model.* Exhibit 2-2 shows an overview of the model.

The model selected commodities from six different food groups (processed grains, baked goods, fresh fruits and vegetables, processed fruits and vegetables, meat and dairy products) in satisfying the nutritional needs of the population. Eight types of nutrients, namely energy, protein, carbohydrates, vitamin C, riboflavin, niacin, thiamin and calcium had to be provided. The amount of each nutrient consumed was bounded by a lower and an upper limit. In addition, the diet was designed to include a minimum proportion of each food commodity. The proportions were based on historical per capita peacetime food consumption patterns.

The processing industries obtain supplies from the agricultural production sector. These supplies consist of grains, meats, milk and fruits and vegetables. The production and processing industries satisfy demand either from production, inventory or imports. The production sector supplies only the processing sector except for the fresh vegetables and fruits industry which supplies to both the processing sector and the population. The processing sector supplies the population as well as some industries within the processing sector. For example, processed grain products (flour, etc.) are consumed by the population directly and these products are also used

---

* Gass, S. I., Linear Programming Methods and Applications McGraw-Hill Book Company, 1975. Chapter 11.

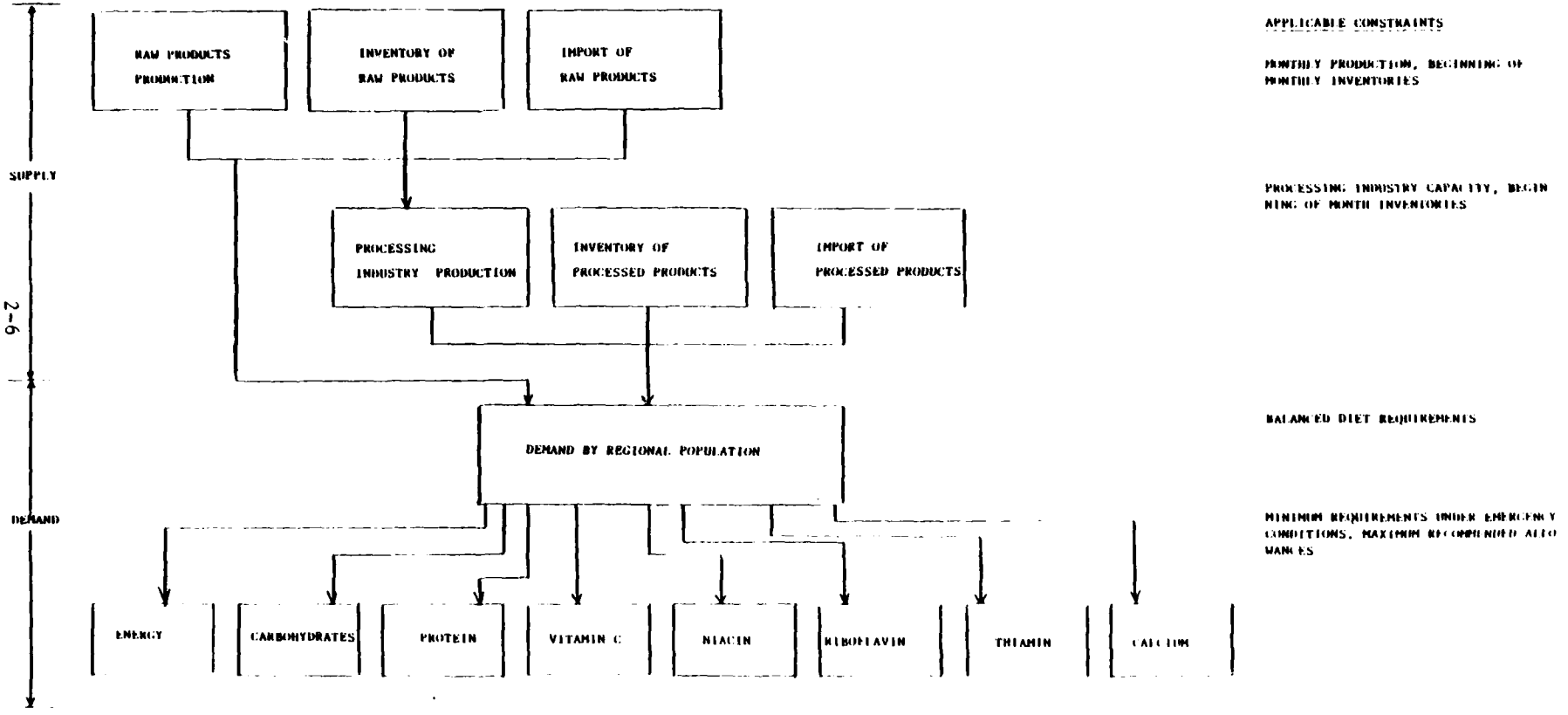


EXHIBIT 2-2 OVERVIEW OF MODEL

as imput to the bakery industry. The mathematical formulation of the model is shown in Exhibit 2-3 and an example of the LP model tableau is shown in Exhibit 2-4. The data sources and derivation methods for the coefficients are given in Appendix B. The variables and row names corresponding to the abbreviations are given in Appendix A.

The model is used to generate monthly optimal production, processing and consumption patterns for each region. It is not designed to analyze food production, processing and demand between months and across regions.

The results of this study could be extended in several ways. For example, they could be used as inputs into the methodology developed by EER to estimate KWBS requirements. Using that methodology, the effects on direct and indirect production requirements and KWBS requirements of a regional system with minimum food import requirements could be estimated. A quantitative estimate of these effects could not be made in this study because the input-output model used in the KWBS study was not available. In order to obtain accurate estimates of KWBS requirements, adjustments to the transportation margins and transportation sectors' final demands would be required to reflect the reduction in inter-regional transportation.

2.3 Data Sources

To analyze the alternatives for satisfying the critical population requirements, the following regional monthly data were required:

1. Inventories of commodities
2. Production levels and processing capacities of commodities
3. Nutritional requirements

EXHIBIT 2-3

LINEAR PROGRAMMING MODEL EQUATIONS

Objective Function: Minimize $\sum_{i=1}^{N} IM_i$ for all i

Subject to:

Supply and Demand: $P_i + I_i + IM_i \geq EX_i + \sum_{j=1}^{N} a_{ij}P_j + b_iD_i$

Production or Processing Limit: $P_i \leq P_{ui}$

Inventory Limit: $I_i \leq I_{ui}$

Nutrients Available in Food = Nutrients Consumed: $\sum_{i=1}^{N} c_{ie}D_i = d_e$ POP for e = 1 to L

Nutrient Upper Limit: $d_e \leq d_{ue}$

Nutrient Lower Limit: $d_e \geq d_{le}$

Balanced Diet Equations: $\dfrac{D_i}{\sum_{i=1}^{N} D_i} \geq FRAC_i$ for i = 1 to N-1

$$\frac{D_{\text{fresh veg/fruit}}}{D_{\text{processed veg/fruit}}} = VFRAC$$

Where i,j = Index signifying food commodity.
e = Index signifying nutrient.
a_{ij} = Amount of i consumed in producing a unit of j.
b_i = Amount of i required to satisfy a unit of demand. (This enables food losses to be taken into account.)
c_{ie} = Amount of nutrient e in one unit of commodity i.
d_e = Amount of nutrient e required per unit of population.
D_i = Amount of commodity i demanded.
IM = Amount of commodity i imparted.
EX_i = Amount of i exported.
$FRAC_i$ = Minimum proportion of i needed in diet.
I_{ui} = Beginning of month inventory of i.
P_i = Amount of i produced.
P_{ui} = Maximum amount of i produced or processing capacity.
POP = Population needing sustenance.
VFRAC = Proportion of fresh vegetables and fruits to processed vegetables and fruits in diet.

EXHIBIT 2-4 Example of Initial Tableau

MMMODEL1 OBJECTIVE: MIN VARIABLES: 50 DATE 04-06-1984
BASIS: NONE CONSTRAINTS: 55 SLACKS: 46 TIME 00:08:00

	GRP	MTP	VGP	MLP	GRI	MTI	VGI	MLI	MTIM	VGIM	MLIM	GRIM	GREX	VGEX	MTEX	MLEX	PRMTI	
1IMPOI									1	1	1	1						1IMPOI
GRBE	-1				-1							-1	1					GRBE
GRUL	1																	GRUL
GRIL					1													GRIL
MTBE		-1				-1			-1						1			MTBE
MTUL		1																MTUL
MTIL						1												MTIL
VGBE			-1				-1			-1				1				VGBE
VGUL			1															VGUL
VGIL							1											VGIL
MLBE				-1				-1			-1					1		MLBE
MLUL				1														MLUL
MLIL								1										MLIL
PRMTBE																	-1	PRMTBE
PRMTUL																		PRMTUL
PRMTIL																	1	PRMTIL
PRGRBE																		PRGRBE
PRGRUL																		PRGRUL
PRGRIL																		PRGRIL
PRVGBE																		PRVGBE
PRVGUL																		PRVGUL
PRVGIL																		PRVGIL
DARBE																		DARBE
DARUL																		DARUL
DARIL																		DARIL
BAKBE																		BAKBE
BAKUL																		BAKUL
BAKIL																		BAKIL
ENRGBE																		ENRGBE
ENRGU																		ENRGU
ENRGL																		ENRGL
PROTBE																		PROTBE
PROTU																		PROTU
PROTL																		PROTL
CALCBE																		CALCBE
CALCU																		CALCU
CALCL																		CALCL
THIOBE																		THIOBE
THIOU																		THIOU
THIOL																		THIOL
VITCBE																		VITCBE
VITCU																		VITCU
VITCL																		VITCL
NACNBE																		NACNBE
NACNU																		NACNU
NACNL																		NACNL
RFLNBE																		RFLNBE
RFLNU																		RFLNU
RFLNL																		RFLNL
CARBOE																		CARBOE
CARBL																		CARBL
FV/PV																		FV/PV
MTRL																		MTRL
VGRL																		VGRL
GRRL																		GRRL
DARL																		DARL
	GRP	MTP	VGP	MLP	GRI	MTI	VGI	MLI	MTIM	VGIM	MLIM	GRIM	GREX	VGEX	MTEX	MLEX	PRMTI	

EXHIBIT 2-4(Continued)

	PRGRI	DARI	BAKI	PRVGI	PGRIM	PMTIM	DARIM	BAKIM	PVGIM	PGREX	PMTEX	DAREX	BAKEX	PVGEX	PRMT	PRGR	PRVG	
1IMPOI					1	1	1	1	1									1IMPOI
GRBE																1.3		GRBE
GRUL																		GRUL
GRIL																		GRIL
MTBE															1.17			MTBE
MTUL																		MTUL
MTIL																		MTIL
VGBE																	1.79	VGBE
VGUL																		VGUL
VGIL																		VGIL
MLBE																		MLBE
MLUL																		MLUL
MLIL																		MLIL
PRMTBE						-1					1				-.84			PRMTBE
PRMTUL															1			PRMTUL
PRMTIL																		PRMTIL
PRGRBE	-1				-1					1						-.96		PRGRBE
PRGRUL																1		PRGRUL
PRGRIL	1																	PRGRIL
PRVGBE				-1					-1					1			-1	PRVGBE
PRVGUL																	1	PRVGUL
PRVGIL				1														PRVGIL
DARBE		-1					-1					1						DARBE
DARUL																		DARUL
DARIL		1																DARIL
BAKBE			-1					-1					1					BAKBE
BAKUL																		BAKUL
BAKIL			1															BAKIL
ENRGBE																		ENRGBE
ENRGU																		ENRGU
ENRGL																		ENRGL
PROTBE																		PROTBE
PROTU																		PROTU
PROTL																		PROTL
CALCBE																		CALCBE
CALCU																		CALCU
CALCL																		CALCL
THIOBE																		THIOBE
THIOU																		THIOU
THIOL																		THIOL
VITCBE																		VITCBE
VITCU																		VITCU
VITCL																		VITCL
NACNBE																		NACNBE
NACNU																		NACNU
NACNL																		NACNL
RFLNBE																		RFLNBE
RFLNU																		RFLNU
RFLNL																		RFLNL
CARBOE																		CARBOE
CARBL																		CARBL
FV/PV																		FV/PV
MTRL																		MTRL
VGRL																		VGRL
GRRL																		GRRL
DARL																		DARL
	PRGRI	DARI	BAKI	PRVGI	PGRIM	PMTIM	DARIM	BAKIM	PVGIM	PGREX	PMTEX	DAREX	BAKEX	PVGEX	PRMT	PRGR	PRVG	

EXHIBIT 2-4(Concluded)

	DAR	BAK	PRGRD	PRMTD	PRVGD	DARD	BAKD	PVGD	ENRG	PROT	CALC	THIO	VITC	NACN	RFLN	CARBO		RHS	
!IMPOI																			!IMPOI
GRBE																	<=	0	GRBE
GRUL																	<=	0	GRUL
GRIL																	<=	314	GRIL
MTBE																	<=	0	MTBE
MTUL																	<=	87	MTUL
MTIL																	<=	141	MTIL
VGBE								1.14									<=	0	VGBE
VGUL																	<=	0	VGUL
VGIL																	<=	2079	VGIL
MLBE	1.9																<=	0	MLBE
MLUL																	<=	339	MLUL
MLIL																	<=	0	MLIL
PRMTBE		.04		1.5													<=	0	PRMTBE
PRMTUL																	<=	177	PRMTUL
PRMTIL																	<=	366	PRMTIL
PRGRBE		1.3	1														<=	0	PRGRBE
PRGRUL																	<=	14	PRGRUL
PRGRIL																	<=	49	PRGRIL
PRVGBE					1.01												<=	0	PRVGBE
PRVGUL																	<=	90	PRVGUL
PRVGIL																	<=	1074	PRVGIL
DARBE	-.86	.02				1.02											<=	0	DARBE
DARUL	1																<=	1832	DARUL
DARIL																	<=	57	DARIL
BAKBE		-1					1.06										<=	0	BAKBE
BAKUL		1															<=	47	BAKUL
BAKIL																	<=	12	BAKIL
ENRGBE			1.121	1.099	.3748	.398	1.337	.3334	-12.49								=	0	ENRGBE
ENRGU									1								<=	117	ENRGU
ENRGL									1								>=	54	ENRGL
PROTBE			.0213	.109	.0065	.021	.036	.0077		-12.49							=	0	PROTBE
PROTU										1							<=	5.05	PROTU
PROTL										1							>=	1.5	PROTL
CALCBE			.165	.073	.074	.747	.279	.098			-12.49						=	0	CALCBE
CALCU											1						<=	72	CALCU
CALCL											1						>=	9	CALCL
THIOBE			2.4	.92	.33	.18	1.47	.33				-12.49					=	0	THIOBE
THIOU												1					<=	135	THIOU
THIOL												1					>=	15	THIOL
VITCBE			75.2	.17	121	3.51		75.26					-12.49				=	0	VITCBE
VITCU													1				<=	5400	VITCU
VITCL													1				>=	300	VITCL
NACNBE			29.5	23.1	3.3	.36	11.9	4.32						-12.49			=	0	NACNBE
NACNU														1			<=	1710	NACNU
NACNL														1			>=	150	NACNL
RFLNBE			2.17	.98	.16	.84	1.01	.26							-12.49		=	0	RFLNBE
RFLNU															1		<=	153	RFLNU
RFLNL															1		>=	30	RFLNL
CARBOE			.2308	.0019	.075	.0273	.247	.064								-12.49	=	0	CARBOE
CARBL																1	>=	5.25	CARBL
FV/PV					-3.2			1									=	0	FV/PV
MTRL			-.15	.85	-.15	-.15	-.15	-.15									>=	0	MTRL
VGRL			-.25	-.25	.75	-.25	-.25	.75									>=	0	VGRL
GRRL			.85	-.15	-.15	-.15	.85	-.15									>=	0	GRRL
DARL			-.25	-.25	-.25	.75	-.25	-.25									>=	0	DARL
	DAR	BAK	PRGRD	PRMTD	PRVGD	DARD	BAKD	PVGD	ENRG	PROT	CALC	THIO	VITC	NACN	RFLN	CARBO		RHS	

4. Population data

5. Nutritional values of foods

More detailed information is given in Appendix B where data sources, assumptions and problems encountered in data collection are explained along with aggregated data tables.

2.3.1 Production, Inventory and Capacity Data

As explained in Section 2.2, in the set-up of the LP model, regional production, capacity and inventory data were required for each month of the year. Therefore, monthly data were collected for about 26 primary and processed products for each state and then aggregated into regional data for the four primary and five processed commodities. The data were for 1982 which was selected as a representative year. The main sources of input data were the U.S. Department of Agriculture (USDA), U.S. Department of Commerce and the National Food Processors Association. Processing capacity data were provided by FEMA from a database developed and maintained by the USDA. The data provided were from the database "ADP Food Processing and Distribution Facilities, USDA Database" which provides estimates of maximum capacity of "facilities of more than local importance".

To assist in comparing this study to others and in using the results in other studies, the data was aggregated using Standard Industrial Classifications (SIC) to the 3-digit level. Exhibit 2-5 shows the types of commodities included in the analysis, the method of data aggregation and the measurement units.

EXHIBIT 2-5 DATA AGGREGATION AND UNITS

COMMODITY USED IN ANALYSIS	FOOD ITEMS INCLUDED IN COMMODITY		MEASUREMENT UNITS
	SIC	FOOD ITEM	
1 Grains	0115	Corn	
	0111	Wheat	
	0112	Rice	
	0116	Soybean	Millions of
	0119	Sorgnum	Pounds
	0119	Rye	
	0119	Barley	
	0119	Oats	
2. Meats	0211	Beef/Cattle	
	0213	Hogs	
	0214	Sheep & Goats	Millions of
	0251	Chickens	Pounds
	0252	Eggs	
	0253	Turkeys	
	0912	Finfish	
	0913	Shellfish	
	0919	Miscellaneous Marine Products	
3. Vegetables & Fruits	0174	Cirtus Fruits	
	0175	Non Cirtus Fruits	
	0175	- Apple	
	0175	- Pear	
	0175	- Peaches	
	0172	- Grapes	
	0173	Nuts (all kinds)	Millions of
	0161	Tomatoes	Pounds
	0161	Potatoes	
	0161	Cauliflower	
	0161	Beans	
	0161	Spinach	
	0161	Lettuce	
	0161	Sweet Corn	
	0161	Peas	
	0161	Green	
	0161	Broccoli	
	0161	Carrots	
4. Milk	0241	Milk	Millions of Pounds

EXHIBIT 2-5 DATA AGGREGATION AND UNITS (cont.)

COMMODITY USED IN ANALYSIS	FOOD ITEMS INCLUDED IN COMMODITY		MEASUREMENT UNITS
	SIC	FOOD ITEM	
5. Dairy Products	2026	Fluid Milk	Millions of Pounds
	2021	Cream	
	2021	Butter	
	2023	Evap. & Cond. Milk	
	2022	Natural Cheese	
	2023	Dry Milk	
6. Processed Grain Products	2041	Flour	Millions of Pounds
	2044	Milled Rice	
	2043	Cereals	
	2045	Bleached Flour	
7. Bakery Products	2051	Bread & other Bakery Products	Millions of Pounds
	2052	Cookies/Crackers	
8. Processed Vegetables/ Fruits	2033	Canned Veg/Fruits	Millions of Pounds
	2034	Dried & Dehydrated Fruits & Veg.	
	2035	Pickled Fruits/Veg	
	2037	Frozen Fruits, Juices & Veg.	
9. Processed Meat Products	2011	Red Meat	Millions of Pounds
	2013	Sausages and Prepared Meat	
	2016	Poultry Dressing Plants	
	2017	Poultry and Egg Processing	
	2091	Canned & Cured Fish	
	2092	Fish and Other Sea Foods	

2.3.2 Population and Nutritional Data

A distinctive feature of this study was to provide food to meet minimum nutritional requirements rather than the commodities specified in the USDA National Emergency Maximum Food Distribution Allowance. This feature allowed satisfying the nutritional needs of the population with commodities produced in the region. The minimum nutritional requirements selected were obtained from an Oak Ridge National Laboratory report* which reviewed many nutritional studies and sets of guidelines. These requirements, shown in Exhibit 2-6, were for a planning period of up to eight weeks, and were prepared by the National Academy of Sciences (NAS).** A single set of requirements for both adults and children was used. After consultation with nutrition experts at NAS and USDA,*** a set of upper bounds for nutrients equal to three times the RDA's was chosen. Also, as discussed previously, no distinction was made between nutritional requirements of adults and children.

The estimated population for each state was obtained from the 1982 Estimated Population published by the Bureau of the Census, Department of Commerce. The state data was aggregated to the (FEMA)

---

* Franz, K.B. and C. H. Kearney, "Maintaining Nutritional Adequacy During A Prolonged Food Crisis," Oak Ridge National Laboratory, August 1979 ORNL 5352

** National Research Council, Food and Nutrition Board, Minimal Allowance of Water and Food for Fallout Shelter Survival, National Academy of Sciences, Washington, D. C. 1963

*** Personnal communication with Kathy Woltaki, National Academy of Sciences and Betty Peterkin USDA, February 1984.

EXHIBIT 2-6 Recommended Minimum Allowances of Nutrients for Shelter Survival of the Population for an Eight Week Period

	Consumption/person/day*	Consumption/million people/month**
Energy	1800 KCal	54×10^9 KCalories
Protein	50 g	1.5×10^6 kg
Carbohydrate	175 g	5.25×10^6 kg
Calcium	0.3 g	9×10^3 kg
Thiamin	0.5 mg	15 kg
Vitamin C	10 mg	300 kg
Niacin	5 mg	150 kg
Riboflavin	0.7 mg	30 kg

---

* Source: National Research Council, Food and Nutritional Board, "Minimal Allowances of Water and Food For Fallout Shelter Survival", National Academy of Sciences, 1963. Reproduced in: K.B. Franz and C.N. Kearney "Maintaining Nutritional Adequacy During a Prolonged Food Crisis, ORNL 5352, 1979.

** Derived from above source, these are the numbers used in the analysis.

regional level for this analysis.

Average nutritional values for each commodity, e.g. grams of protein/pound of meat, were developed by taking a weighted average of nutritional values of foods conforming to normal consumption within each commodity group.

3.0 REGIONAL FOOD SUPPLY AND DEMAND ANALYSIS

The purpose of the analysis in this section was to evaluate the supply-demand conditions within individual regions to determine optimal regional monthly food production, processing and consumption patterns that minimize inter-regional commodity shipments. The analysis enabled identification of regions that are self-sufficient in food commodities. In the case of shortages of any food commodity in a region, alternative approaches to satisfy demand, such as imports from nearby regions, were then evaluated.

The methodology used for this analysis is described in Section 2.2. The linear programming model was executed for 12 months for each of the 10 regions to determine the monthly production, processing and consumption patterns that minimized imports. Detailed results of the analysis are given in Appendix C.

3.1 Principal Conclusions

Regions 8, 9 and 10 are self-sufficient throughout the year. However, Regions 1 through 7 need one or more commodities imported from other regions, under the minimum import scenario. Exhibit 3-1 shows a summary of the results for regions one through seven which indicate the commodities to be shipped into those regions.

As indicated in Exhibit 3-1, in Regions 1, 4 and 6 imports are required for all 12 months. In general, the commodities, which need to be imported are fresh vegetables and fruits, dairy products, and baked goods. The principal reasons for importing commodities are inadequate processing capacity or very low production in these regions. For example, Region 4 has inadequate production and stocks

EXHIBIT 3-1 Summary of Supply-Demand Analysis Results

Commodity	Regions Requiring Imports	Period when Imports are Required	QUANTITY IMPORTED Minimum (Million lbs.)	Maximum (Million lbs.)	Average (Million lbs.)	Annual (Million lbs.)	Per Capita (lbs/Person-Year)
1. Grains	None	None	0	0	0	0	0.0
2. Milk	None	None	0	0	0	0	0.0
3. Fresh Fruit/Veg	2	Mar-June	101 (Feb)	228 (May)	171	684	27.3
	3	Mar-June	19 (June)	242 (May)	153	612	25.4
	4	Jan-Mar & Aug-Dec	1 (July)	255 (March)	148	1335	33.2
	5	May	204 (May)	204 (May)	204	204	4.5
	6	Jan-Dec	9 (May)	313 (Jan)	187	2266	84.7
	7	Feb-Aug & Nov	4 (Nov)	147 (May)	77	616	52.0
4. Meat	None	None	0	0	0	0	0.0
5. Processed Grain Products	None	None	0	0	0	0	0.0
6. Baked Goods	1	Jan-Dec	79 (Jan-Dec)	79 (Jan-Dec)	79	948	75.9
7. Processed Meats	None	None	0	0	0	0	0
8. Dairy Products	1	Jan-Dec	17 (April)	55 (Nov)	40	480	38.4
	4	Jan-Dec	44 (April)	146 (Nov)	107	1284	32.0
	6	Jan-Dec.	25 (March)	129 (Nov)	81	972	36.7
9. Processed Fruit/ Vegatables	None	None	0	0	0	0	0.0

of fruits and vegetables from January to March and August to December. Region 1 has to import baked goods and dairy products. The reason for the import of baked goods is not a shortage of such goods or inadequate baking capacity, but, a shortage of grain milling capacity and flour stocks. On the other hand, the need to import dairy products is due to a shortage of milk production capacity and not due to an inadequate processing capacity. For example, in Region 1, the capacity utilization of the dairy processing capacity is very low, about 10 percent. However, because there is insufficient milk production in the region, imports of processed dairy products are required. A long term peacetime strategy would be to gradually develop these specific industries/capabilities in shortage regions through Gevernment subsidies, tax credits, etc.

Exhibit 3-2 gives the monthly total shipments into the regions. The months from March to May require maximum imports since production is low and inventories are being depleted. For example, the inventories are highest in December and January and tend to reach a minimum by April and May. They, then, start increasing again as the product harvest occurs. The model has taken into account variations in harvesting periods for various crops in different parts of the country.

3.2 Alternative Strategies For Minimizing Imports

The purpose of this analysis is to modify some of the restrictions placed on production, processing and consumption to determine if alternative strategies could enable imports to be minimized. The strategies evaluated were the following:

EXHIBIT 3-2

TOTAL MONTHLY SHIPMENTS INTO THE REGIONS
(MILLION POUNDS)

Regions	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
1	120	125	111	96	115	130	123	127	118	112	134	111	1428
2	0	0	101	217	228	136	0	0	0	0	0	0	682
3	0	0	140	211	242	19	0	0	0	0	0	0	612
4	308	367	341	44	97	135	126	233	269	178	267	256	2621
5	0	0	0	0	204	0	0	0	0	0	0	0	204
6	355	373	304	180	81	117	238	261	392	283	300	330	3214
7	0	0	0	0	0	0	0	0	0	0	0	0	611
8	0	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	783	878	1032	845	1114	654	602	708	779	573	701	697	9399

- Allowing commodity shipments between adjacent regions. This strategy allows imports, but minimizes transportation requirements
- Relaxing the required proportion of fresh to processed fruits and vegetable consumption
- Increasing the processing capacity of capacity-limited commodities by using two and three shifts a day.

Exhibit 3-3 shows the alternative strategies investigated for each of the regions requiring imports. The feasibility and effectiveness of each of these alternative strategies is discussed below.

3.2.1 Interregional Commodity Shipment Between Adjacent Regions.

This strategy was evaluated by combining two adjacent regions and executing the LP model for this combination. The combinations analyzed were the Regions 1 and 2, 4 and 5, and 6 and 7. The combined regions were able to supply all their food requirements with no additional imports. Thus, allowing imports from adjacent regions is a satisfactory strategy which eliminates all import requirements.

3.2.2 Removing the Needs for Proportionate Consumption of Fresh and Processed Vegetable/Fruits.

In the LP model, a constraint corresponding to normal proportions of fresh to processed fruits and vegetable consumption was used. Such a constraint was required since aggregation at the 3-digit SIC level implies a fixed proportion of commodities within an SIC category. This resulted in imports of fresh fruits and vegetables into regions with adequate processed fruits and vegetables. When this constraint was relaxed for Regions 3, 4 and 7, it was no longer necessary to import fruits and vegetables into Region 3 and 4, while in Region 4, the total imports declined from 2468 to 1150 million pounds a year.

EXHIBIT 3-3 Alternative Strategies for Regional Self-Sufficiency

Regions	Regional Self-Sufficiency Status	Alternative Strategies
1	Insufficient	Combining it with Region 2, makes the integrated region self-sufficient.
2	Insufficient	Combining it with Region 1, makes the integrated region self-sufficient.
3	Insufficient	Removing the proportionality constraint on fresh and processed fruits and vegetables eliminates the need for imports.
4	Insufficient	Removing fresh to processed vegetables/fruits ratio constraint and combining it with Region 5 makes the regions self-sufficient.
5	Insufficient	Removing fresh to processed vegetables/fruits ratio constraint and combining it with Region 4 makes the region self-sufficient.
6	Insufficient	Combining it with Region 7 and removing the fresh to processed vegetables/fruits ratio constraint makes the region self-sufficient.
7	Insufficient	Removing the fresh to processed vegetables/fruits ratio constraint makes the region self-sufficient.
8	Self-sufficient	-
9	Self-sufficient	-
10	Self-sufficient	-

3.2.3 Increasing the Operating Capacity of Grain Milling Plants

This strategy is only required in Region 1 which imported baked goods due to inadequate grain milling capacity.

In the short-term, milling capacity can be increased by increasing operating hours. In Region 1, ten percent of the grain milling industry, SIC 2041 flour milling, already operates 168 hours a week. Since this SIC, the flour milling industry, is the principal supplier to the baked goods industry, increasing operating hours as a means of providing more flour to the bakeries is infeasible.

Thus, implementing this strategy would require building more flour milling plants or, alternatively, increasing the inventories of flour or baked goods in Region 1.

3.3 Conclusions Of Supply-Demand Analysis

The principal conclusion drawn from the regional supply-demand analysis are summarized below:

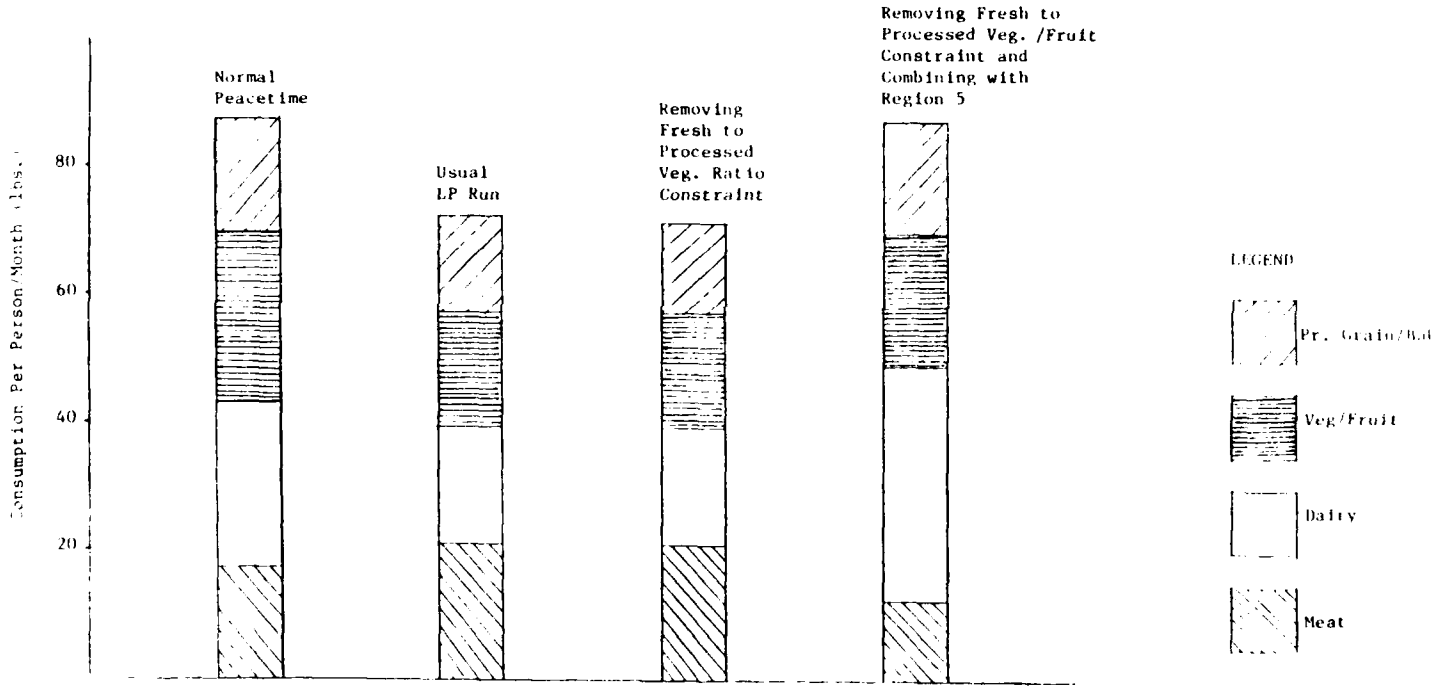
- Regions 8, 9 and 10 can meet the demand for food with no import requirements
- Regions 1 through 7 require import of one or more commodities for either part or all of the year
- Regions 1, 4 and 6 require larger quantities of imports than Region 2, 3, 5, and 7
- The commodities in short supply are fresh fruit/vegetables, dairy products and baked goods
- Import requirements tend to be highest in the months March, April and May when inventories decline to their lowest level and agricultural production is also low
- If commodity shipments from adjacent regions are allowed, then none of the integrated regions need any imports
- By removing the fresh to processed vegetables/fruits ratio constraint, the quantities of fresh fruits and vegetables to be imported decrease substantially

- The processing capacity of the dairy products industry seems to be unusually large since capacity utilization seldom increases above 10 percent

- As demonstrated in Exhibit 3-4, the alternative strategies cause slight changes in the consumption patterns.

EXHIBIT 3-4

EFFECT OF ALTERNATIVE STRATEGIES
ON FOOD CONSUMPTION PATTERNS
FOR REGION 4



4.0 COMPARISON OF STUDY RESULTS WITH REQUIREMENTS ASSOCIATED WITH ALTERNATIVES

A comparison of the patterns of consumption in our model to those of peacetime and the USDA National Maximum Emergency Distribution Allowance helps to verify the validity of the model results and provides insight into potential reductions in transportation and blast shelter requirements.

Total per capita consumption and the relative and absolute consumption of each of the four food categories, meat, dairy, fruits and vegetables, and bakery and grain products, for the three scenarios were compared. Total inter-regional shipments for the regional system and historical inter-regional shipments were also compared to estimate the potential reduction in transportation requirements. In addition, regional and monthly food consumption variations were examined to assess the equity across the regions and the effect of the time of year of the regional food production and distribution strategy.

4.1 Comparison of the Study Results with Peacetime and USDA Emergency Allowance Consumption

Comparison of total per capita consumption in the three alternatives shows that, on an annual basis, consumption is lowest for the regional, nutrient-based alternative. For the nation as a whole, average annual total per capita consumption is approximately fifteen percent lower than the corresponding peacetime consumption*, and six percent lower than the corresponding USDA Emergency Allowance

---

* U.S. Department of Commerce, Bureau of the Census Statistical Abstract of the United States 1981.

value. Exhibit 4-1 shows annual per capita consumption of each commodity for each region and for peacetime and the USDA Emergency Allowance. In nine of the ten regions, total per capita consumption is lower than the peacetime alternative. In the tenth region, total annual per capita consumption is approximately nineteen percent higher than peacetime consumption. In this region, the additional food consumed is in the dairy group, which is mainly milk, and in the grains group which are generally less dense in nutrients than meats.

Another feature examined in comparing the three alternatives was the relative consumption of each catagory of food. This is illustrated in Exhibits 4-2 and 4-3. For the nation, average annual per capita consumption was nearly evenly distributed among the four food groups. However, as Exhibit 4-2 shows, there are wide regional variations in the mix of foods consumed. These reflect monthly regional variations in food production and processing. All of the regions have lower consumption levels of fruits and vegetables than the corresponding peacetime level. Most likely this results from discontinuing transcontinental transportation of these commodities. In general, the regions have higher consumption of grain and bakery products than in peacetime; this results from the large production of grain products in the United States. For the nation, average per capita consumption of dairy products is close to the peacetime consumption level. Exhibit 4-3 shows the range of consumption of each commodity in the regional model analysis along with the corresponding values for peacetime and the USDA Emergency Allowance.

EXHIBIT 4-1

ANNUAL PER CAPITA CONSUMPTION OF EACH COMMODITY
(LB/PERSON/YEAR)

		MEAT	DAIRY PRODUCTS	FRUIT/VEG	BAKERY/GRAIN PRODUCTS	TOTAL
LP MODEL ANALYSIS	REGION 1	240	237	329	142	948
	REGION 2	197	254	277	227	955
	REGION 3	319	283	262	185	1050
	REGION 4	254	218	218	181	870
	REGION 5	201	207	207	213	829
	REGION 6	129	215	215	301	859
	REGION 7	119	198	198	277	792
	REGION 8	178	202	202	226	809
	REGION 9	269	322	287	214	1091
	REGION 10	259	491	345	242	1337
	NATIONAL AVERAGE	217	263	254	221	954
	USDA EMERGENCY ALLOWANCE	181	411	211*	208	1011**
	PEACETIME	286	264	425	150	1126
LP MODEL ALTERNATIVE STRATEGIES ANALYSIS	REGIONS 1&2	207	253	338	190	988
	REGIONS 4&5	159	457	264	175	1056
	REGIONS 6&7	129	216	216	302	862

* This value apparently does not include fresh vegetables and fruits. The previous standard prescribed 315 lb/person/year (approximately 6 lb/person/week for fruits, vegetables, and potatoes).

** Under the previous standard, with higher fruit and vegetable consumption, this total was 1115.

EXHIBIT 4-2

COMPARISON OF ANNUAL PER CAPITA CONSUMPTION

OF EACH COMMODITY

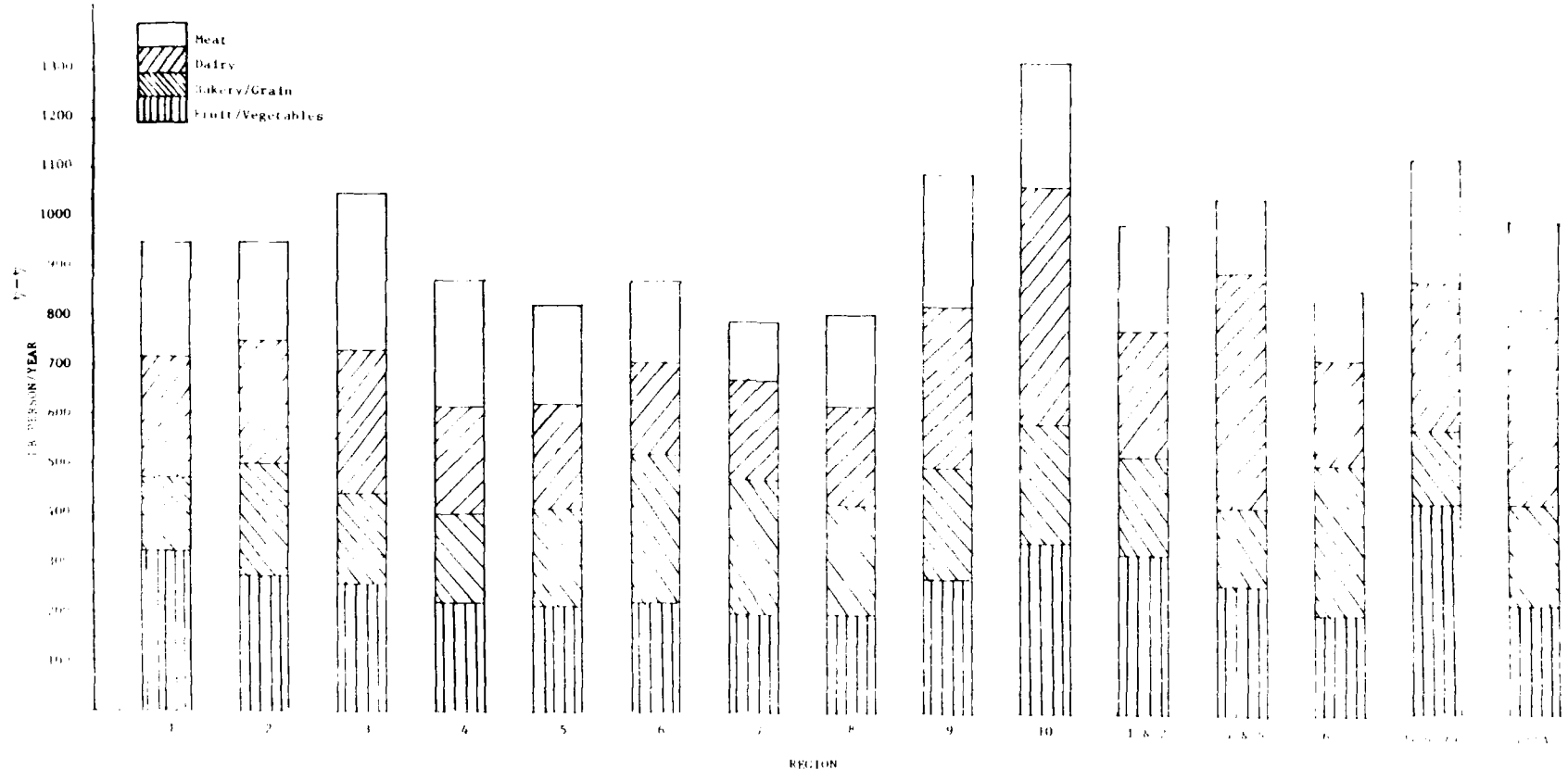


EXHIBIT 4-3

RANGE OF CONSUMPTION OF COMMODITIES IN THE REGIONAL MODEL COMPARED TO PEACETIME AND THE USDA EMERGENCY ALLOWANCE CONSUMPTION

(lb/person/year)

	Regional Model			USDA Emergency Allowance	Peacetime
	Average	Maximum	Minimum		
Fruit/Vegetables	254	345	198	211	425
Bakery/Grain	221	301	142	208	150
Dairy	263	491	198	411	264
Meat	216	319	119	181	286
Total Consumption	954	1337	792	1011	1126

The comparison of the regional results with the USDA Emergency Allowance shows that, in general, the regional consumption of dairy products is lower than the corresponding consumption levels in the alternative. The USDA Emergency Allowance for milk is considerably higher (56% higher) than peacetime consumption, whereas, as noted above, the regional consumption is generally closer to peacetime consumption. However one region, region 10, has very high dairy consumption, actually higher than the Emergency Allowance. Meat consumption is, on average, higher in the regional strategy than the USDA Emergency Allowance, although two regions have lower consumption of meat than the Emergency Allowance.

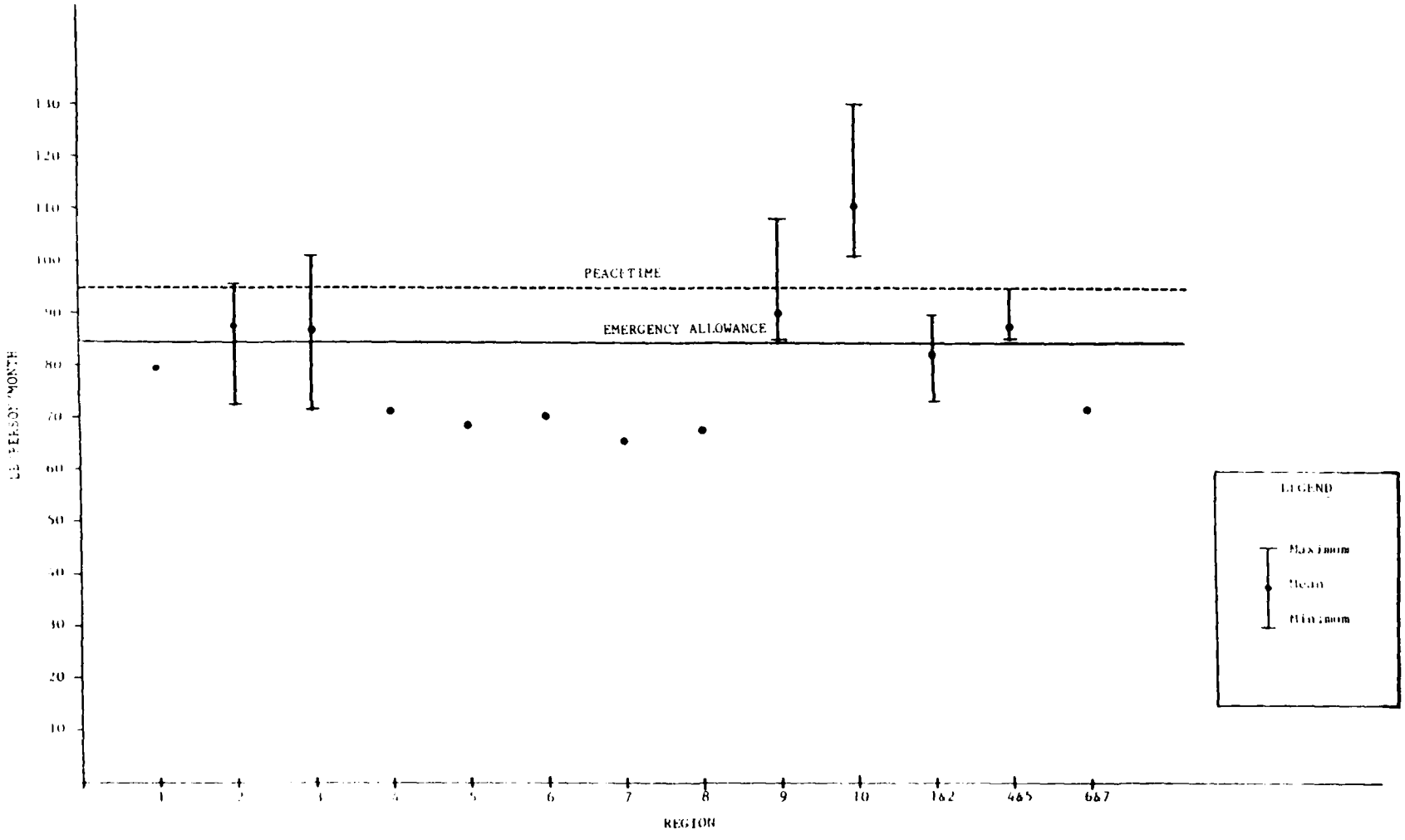
As noted above, total annual per capita consumption is lower in most of the regions than peacetime or the USDA Emergency Allowance consumption. This is generally true on a monthly basis as well. As *Exhibit 4-4* shows, six of the ten regions have approximately constant monthly per capita consumption levels regardless of the month. All of these are lower than average monthly peacetime or USDA Emergency Allowance total per capita consumption. Four of the ten regions have wide variations in monthly consumption and these exceed peacetime and Emergency Allowance consumption in one or more months. The variations in monthly consumption levels reflect seasonal variations in production and in inventory availability.

As this analysis shows, the strategy of minimizing imports and providing food to meet minimum nutritional requirements does generally reduce total food consumption, and, therefore would probably reduce transportation and blast shelter requirements. It is expected that an analysis of this consumption pattern, similar to

EXHIBIT 4-4

RANGES OF REGIONAL MONTHLY PER CAPITA CONSUMPTION

COMPARED TO MONTHLY PEACETIME AND EMERGENCY ALLOWANCE CONSUMPTION



that performed in the Key Worker Blast Shelter Study, will be performed to quantitatively determine achievable reductions in blast shelter requirements. Accurate estimates of achievable reductions in transportation requirements may be difficult to obtain without extensive data collection and sophisticated work in transportation modeling. Section 4.2 gives an indication of the potential reduction. As expected, there are great regional variations in the mix of foods consumed under the regional strategy. This study shows that minimum nutritional requirements can be met with restrictions on interregional food transportation by substituting a mix of foods different from normal consumption. The similarities in the consumption levels of the regional model to the other alternatives indicate that the model does provide valid, practical results.

4.2 Comparison Of The Study Results With Peacetime Inter-Regional Commodity Shipments

In this section, the results of the LP analysis described in sections 3.1 and 3.2 are compared with inter-regional commodity shipments during peacetime. The purpose of the comparison was to investigate the extent to which inter-regional food commodity shipments can be reduced and still maintain a balanced diet for the regional population.

The data for inter-regional commodity shipments was obtained from the 1977 Commodity Transportation Survey.* It should be noted that the regions used in the survey were different from the FEMA

*"Commodity Transportation Survey" Summary 1977, Bureau of Census, Department of Commerce. This is the most recent data available.

regions except for region 1. Thus, comparing the LP model results with peacetime inter-regional shipments was not possible for each region. Consequently, the total US inter-regional shipments were compared for each commodity.

Exhibit 4-5 shows the imports of each commodity required for each (FEMA) region as calculated by the LP analysis (Appendix C) and Exhibit 4-6 gives the actual 1977 inter-regional commodity shipments. The results of the two analyses are compared in Exhibit 4-7. This exhibit shows that the LP analysis results require only 9.4 billion pounds of imports from other regions compared to peacetime regional imports of 45 billion pounds. Consequently, inter-regional transportation requirements might be drastically reduced if a regionally based food production, processing and distribution plan were implemented, but the exact magnitude of the reduction cannot be determined without a more extensive analysis.

About 52 percent of the inter-regional import reduction is due to reduced grain shipments. Nearly 28 percent of the reduction is caused by reduced shipments of meat products. The remaining 20 percent reduction is due to smaller shipments of dairy products, baked goods and fruits and vegetable products.

It should be noted that this comparison disregards regional food demand changes due to population increases and shifts since the LP model results were based on 1982 data and the peacetime shipments were 1977 data. It is most likely that the actual peacetime inter-regional shipments in 1982 would be greater than in 1977. Thus, the import reduction potential of a regionally-based food system would be greater than that implied in the above analysis.

EXHIBIT 4-5

ANNUAL INTER-REGIONAL COMMODITY SHIPMENTS AS PER LP ANALYSIS

(Million Pounds)

Region	Meat SIC=201	Dairy Product SIC=202	Fruits/Veg Fresh SIC=016,017	Bakery Goods SIC=205	Grain Mill Products SIC=204	Processed Fruit/Veg SIC=203	TOTAL
Region 1	0	480	0	948	0	0	1428
Region 2	0	0	684	0	0	0	684
Region 3	0	0	612	0	0	0	612
Region 4	0	1284	1335	0	0	0	2619
Region 5	0	0	204	0	0	0	204
Region 6	0	972	2244	0	0	0	3216
Region 7	0	0	616	0	0	0	616
Region 8	0	0	0	0	0	0	0
Region 9	0	0	0	0	0	0	0
Region 10	0	0	0	0	0	0	0
U.S.	0	2736	5695	948	0	0	9399

EXHIBIT 4-6

ANNUAL INTER-REGIONAL COMMODITY SHIPMENTS IN 1977

(Million Pounds)

Region	Meat SIC=201	Dairy Product SIC=202	Veg/Fruits SIC=203	Processed Grain SIC=204	Baked Goods SIC=205	TOTAL IMPORTS
New England	529	127	1116	1626	646	4689
Middle Atlantic	1754	727	1801	2711	389	7382
East N. Central	1983	419	1611	3043	368	7424
West N. Central	487	348	1212	1223	201	3471
South Atlantic	1382	955	1431	4256	313	8337
East So. Central	513	343	612	2067	304	3839
West So. Central	671	878	675	1679	163	4066
Mountain	363	524	469	611	180	2146
Pacific	2143	345	476	1496	55	4515
U.S.	9825	4666	9403	18,712	2619	45,025

Note: The above data excludes intra-regional shipments.

Source: "Commodity Transportation Survey" Summary 1977, Bureau of Census, DOC.

EXHIBIT 4-7

COMPARISON OF LP MODEL ANALYSIS RESULTS AND PEACETIME INTER-REGIONAL COMMODITY FLOWS

(Million Pounds)

	Meat SIC=201	% of Total	Dairy Products SIC=202	% of Total	Fruits/Veg SIC=203	% of Total	Grain Mill Products SIC=204	% of Total	Baked Goods SIC=205	% of Total	Total
Total Shipments by LP Analysis	0	0	2736	30	5695	60	0	0	948	10	9399
Shipments based on 1977 Inter-regional Commodity Flow Data	9825	22	4466	10	9403	21	18712	40	2619	6	45025

5.0 POLICY AND PLANNING IMPLICATIONS

5.1 Policy Implications

There are a number of policy implications, both positive and negative, associated with a regional system of food production, processing and distribution. These are described below.

The results from the linear programming model analysis indicate that most of the regions can supply a quantity and mix of foods sufficient to meet the minimal nutritional requirements of their populations with little or no imports from other regions. In the regions that require some imports, when imports from adjacent regions are allowed, the two regions become a self-sufficient unit (e.g. Regions 1 and 2, 4 and 5, 6 and 7). In most regions, the level of food consumed is also lower than the normal peacetime or USDA emergency allowance consumption. As Exhibit 5.1 shows, capacity utilization is generally less than 100% for most of the major food groups. Qualitatively, these results imply that adequate food production, processing, and distribution can be accomplished with fewer workers and reduced transportation than previously estimated. Although a reduction in interregional shipments was noted,this does not necessarily imply less transportation distances because of the sizes of the regions themselves. Also most of the distances travelled takes place outside the risk areas and loading and unloading in the risk areas would still be a problem. Therefore, the reduced shipments may not be able to reduce blast shelter requirements.

Another advantage of this system is that it would facilitate coordination of consumption requirements with production. Under current FEMA guidance, food would be distributed to the population

EXHIBIT 5-1

CAPACITY UTILIZATION OF PROCESSING INDUSTRIES (PERCENT)

MONTH	INDUSTRY	REG 1	REG 2	REG 3	REG 4	REG 5	REG 6	REG 7	REG 8	REG 9	REG 10
JANUARY	BAKERY	0	0	0	7	100	100	59	30	0	0
FEBRUARY		0	0	0	9	100	100	59	31	0	0
MARCH		0	90	31	11	100	100	59	31	0	0
APRIL		0	91	31	11	100	100	59	31	0	0
MAY		0	91	33	12	100	100	59	31	0	0
JUNE		0	91	33	11	100	100	59	31	0	0
JULY		0	0	0	9	100	100	59	30	0	0
AUGUST		0	0	0	8	100	100	59	30	0	0
SEPTEMBER		0	0	0	9	100	100	59	30	0	0
OCTOBER		0	0	0	11	100	100	59	30	0	0
NOVEMBER		0	0	0	13	100	100	59	30	0	0
DECEMBER		0	0	0	14	100	100	59	30	0	0
JANUARY	DAIRY	10	17	26	10	3	19	4	4	25	15
FEBRUARY		9	16	19	9	2	18	4	4	23	14
MARCH		10	12	16	11	3	21	7	4	26	16
APRIL		11	12	17	12	3	20	4	4	29	18
MAY		10	12	16	10	2	18	2	4	26	16
JUNE		9	11	16	9	1	16	1	3	23	15
JULY		10	17	26	10	1	16	1	3	26	17
AUGUST		9	16	25	9	1	16	1	3	25	16
SEPTEMBER		10	17	27	10	2	17	1	3	27	17
OCTOBER		10	17	28	10	1	17	1	3	26	17
NOVEMBER		9	15	24	9	1	15	0	2	23	14
DECEMBER		10	17	28	10	1	17	0	2	26	17
JANUARY	PROCESSED	0	0	0	0	0	0	0	0	5	0
FEBRUARY	FRUIT AND	0	0	0	0	0	0	0	0	5	0
MARCH	VEGETABLES	0	0	0	0	0	0	0	0	5	0
APRIL		0	0	0	2	0	0	0	0	5	0
MAY		0	0	0	11	0	0	0	0	5	0
JUNE		0	0	0	5	0	0	0	0	5	0
JULY		13	0	3	0	5	0	0	19	9	1
AUGUST		92	93	35	0	5	0	0	19	5	1
SEPTEMBER		92	100	30	0	5	0	0	19	5	1
OCTOBER		92	77	18	0	5	0	0	19	5	2
NOVEMBER		6	0	0	0	2	0	0	0	5	1
DECEMBER		0	0	0	0	0	0	0	0	5	1

EXHIBIT 5-1 (CONTINUED)

MONTH	INDUSTRY	REG 1	REG 2	REG 3	REG 4	REG 5	REG 6	REG 7	REG 8	REG 9	REG 10
JANUARY	PROCESSED	100	100	100	100	48	42	53	100	100	100
FEBRUARY	GRAIN	100	100	84	100	49	33	53	100	100	100
MARCH		100	100	100	100	49	28	53	100	100	100
APRIL		100	100	100	100	48	29	53	100	100	100
MAY		100	100	100	100	66	29	53	100	100	100
JUNE		100	100	100	100	45	35	27	100	100	100
JULY		100	100	100	100	45	42	28	100	100	100
AUGUST		100	100	100	100	44	50	28	100	100	100
SEPTEMBER		100	100	100	100	44	43	28	100	100	100
OCTOBER		100	100	100	100	44	40	27	100	100	100
NOVEMBER		100	100	100	100	45	38	52	100	100	100
DECEMBER		100	100	100	100	52	37	51	100	100	100
JANUARY	PROCESSED	6	13	18	23	0	0	0	0	34	0
FEBRUARY	MEAT	0	7	18	24	0	0	0	0	33	0
MARCH		28	48	10	24	0	0	0	0	34	0
APRIL		30	49	8	23	0	0	0	0	0	0
MAY		26	48	8	23	0	0	0	0	0	0
JUNE		22	46	7	22	0	0	0	0	0	0
JULY		11	13	19	21	0	0	0	0	0	0
AUGUST		2	13	23	20	0	0	0	0	0	0
SEPTEMBER		0	13	0	19	0	0	0	0	0	0
OCTOBER		.00	14	22	20	0	0	0	0	0	0
NOVEMBER		.00	14	20	20	0	0	0	0	0	0
DECEMBER		.00	14	20	21	0	0	0	0	0	0

according to the USDA Emergency Allowance but production would follow peacetime patterns. Since the Emergency Allowance differs significantly in some respects from peacetime consumption, it would be difficult to implement the FEMA guidelines consistently. If the food substitution guidelines provided by FEMA were followed in order to match consumption with the foods available, consumption would probably differ little from peacetime, and blast shelter requirements would be relatively high. In contrast, the regional strategy provides a mix of commodities to the population consistent with the food available from regional production in a particular time period rather than providing the same mix of food regardless of location or time of year. At the same time, the mix of foods provided by the regional system also results in consumption lower than in peacetime while satisfying the nutritional requirements of the population. Thus, while additional planning would be required for the regional system, it is more likely that this system would provide adequate nutrition with minimum transportation than would the alternative "business as usual"/USDA Emergency Allowance alternative.

In addition, the regional strategy would provide several advantages in a postattack environment. An attack would probably cause major disruptions in long distance transportation of goods due to damage to equipment, roads and communications systems; damage to food production (e.g. crops), processing and distribution facilities (e.g. warehouses) would also make supplies of a normal mix of foods difficult to obtain. Plans for a regional system, which would include identification of resources on a regional basis, would aid in providing adequate food to meet nutritional requirements with lower

consumption and reduced transportation. This would increase the probability of survival of larger portions of the population.

Lastly, an analysis was carried out to evaluate the effects of the regionalized food distribution system on blast shelter requirements. The requirements for blast shelter are expected to reduce under this system due to the following results:

(1) The present scenario gives less food consumption (per capita) than USDA emergency allowance.

(2) The capacity utilization of the food processing industries was found to be considerably low.

The analysis was carried out to get a quantitative measure of the reduction in blast shelter. It was assumed that percentage reduction in any food commodity consumption would reduce the blast shelter requirements by the same percentage. Exhibit 5-2 lists the food commodities consumption by USDA emergency allowance and by the regionalization scenario. Percentage change was calculated for each food commodity and was applied to find the blast shelter requirements as shown in Exhibit 5-3. The exhibit shows that in some cases the blast shelter requirements increase while in other decrease. However there is a net decrease of about 2 percent, which is insignificant. The processing capacities of the food industries are not fully utilized under this system. But the processing in non-risk areas should be at the maximum capacity during the crisis period so that the excess commodities can be stored for the post-disaster period. The results of the study may actually require more production in risk areas to compensate for what in peacetime would be an interregional shipment from a non-risk area. Therefore the reductions in blast shelter requirements under this system may not be appreciable.

Naturally, a number of difficulties would be associated with the

EXHIBIT 5-2

COMPARISON OF FOOD CONSUMPTION UNDER USDA EMERGENCY ALLOWANCE AND REGIONALIZATION SCENARIO

SIC	Food Commodity	Average Consumption under USDA Allowance (lbs/person/year)	Average Consumption under Regionalization Scenario (lbs/person/year)	Difference	Percentage Difference
201	Meat Products	181	217	36	20
202	Dairy Products	411	253	-148	-36
203	Veg/Fruits (Processed)		61		
015 & 016	Veg/Fruits (Fresh)	211	193	43	20
204	Processed Grain Products		108		
205	Baked Goods		113	-13	-6
	Total		955	-56	-6

EXHIBIT 5-3
EFFECT OF REGIONALIZATION SCENARIO
ON BLAST SHELTER REQUIREMENTS

SIC	Food Commodity	BLAST SHELTER SPACE REQUIREMENTS: Under USDA Emergency Scenario	BLAST SHELTER SPACE REQUIREMENTS: Adjusted to Reflect Regionalization Scenario
201	Meat Products	19248	23098
202	Dairy Products	6838	4376
203	Veg/Fruit (fresh)	3732	4478
204	Processed Grain Products	25402	66505
205	Baked Goods	45348	
	Total	100,568	98457

major changes in the food system associated with this regional strategy. First, this type of system would require a major reorganization of the food system network. It would be necessary to identify virtually all producers and processors and to redirect shipments to alternative destinations. It would be necessary to develop planning mechanisms to gather data and provide coordination in redirecting commodities. Memorandums of Agreement between Regional Coordinators with regard to food supply would be of value in the planning effort. Because this system would involve more levels of the food chain than under current FEMA guidelines, more government control would be required. However, government control of all aspects of the economy and society in general would be increased substantially in a crisis or postattack situation, so this additional control of the food system would seem less extreme than under normal conditions.

Second, production and processing would have to be adjusted in regions that normally export substantial quantities of food to other regions (e.g. California). Mechanisms would be required to prevent losses of perishable foods. In fact, more processing capacity than normal would probably be required in order to process fruits and vegetables that would normally have been consumed without processing. For example, if the demand outside the region for fresh and processed fruits and vegetables from California was abruptly reduced, producers and processors could incur substantial losses in revenue and they would have no incentives to harvest or process the excess food. Although losses of excess food might not be harmful in the short term, in the long term, this food would be needed. This problem would occur in other forms as well, for example, a decline in meat

consumption would cause an increase in the demand for livestock feed. A mechanism, such as government compensation, would be needed to mitigate the effects of an abrupt change in demand. Government support programs for agriculture exist today, so such a mechanism would not be completely different from current policies. A mechanism for directing redistribution efforts under emergency conditions would be required, however.

Third, a regional system with minimum inter-regional imports, as developed in our model, could result in depletion of inventories and food shortages in the long term. Because the model developed does not link together production and consumption from one month to the next, the magnitude and location of inventory depletions are difficult to determine. Development of a larger model in which monthly data were analyzed sequentially and regions were linked together would generate the needed information.

Finally, a question arises concerning the level of industry cooperation that could be expected in order to plan and implement a regional food system. Current planning emphasizes minimizing disruption of the current food supply system. One factor in support of this policy is the support of food industry personnel. For example, food industry personnel strongly favor continuing operation of warehouses in high risk areas rather than trying to shift warehousing activities to lower risk areas.* From the discussion given above,

---

* "Guidelines and Data to Support Plans for Reallocating Food During Crisis Relocation" SYSTAN Inc., December 1982.

the conclusion derived is that the self-sufficiency scenario may not

be worth its efforts in pre-attack planning situations due to economic problems and level of Government control required. However, the scenario presents a positive contribution towards post attack planning in supplying food demand with minimum nutritional requirements and with a minimum amount of help. Moreover, there may not be much choice in a post attack period but to use regional resources rather than importing from other regions.

5.2 Data Requirements to Implement Proposed Regional Food Self-Sufficiency Strategy

This section characterizes the database management systems needed to plan and execute a regionalized food production and distribution system for crisis conditions. The current status of the data used in the analysis is discussed along with problems and steps to be taken to improve the data system.

Data requirements identified in this study include monthly regional production, inventories, and processing capacities of the commodities. In addition, data on regional populations, nutritional requirements and inter regional commodities shipments are needed. For this analysis, these data were collected from a number of sources; many problems and deficiencies were found. These included:

1. Incomplete data
2. Inconsistant units
3. Inconsistant aggregation methods (products, regions, time)
4. Data confidentiality

Exhibit 5-4 shows some examples of these problems along with current solutions and preferred solutions. The current solutions are the measures used in this study to impute values when data were unavailable.

EXHIBIT 5-4

EXAMPLES OF PROBLEMS ENCOUNTERED DURING DATA COLLECTION, SOLUTIONS USED AND PREFERRED SOLUTIONS

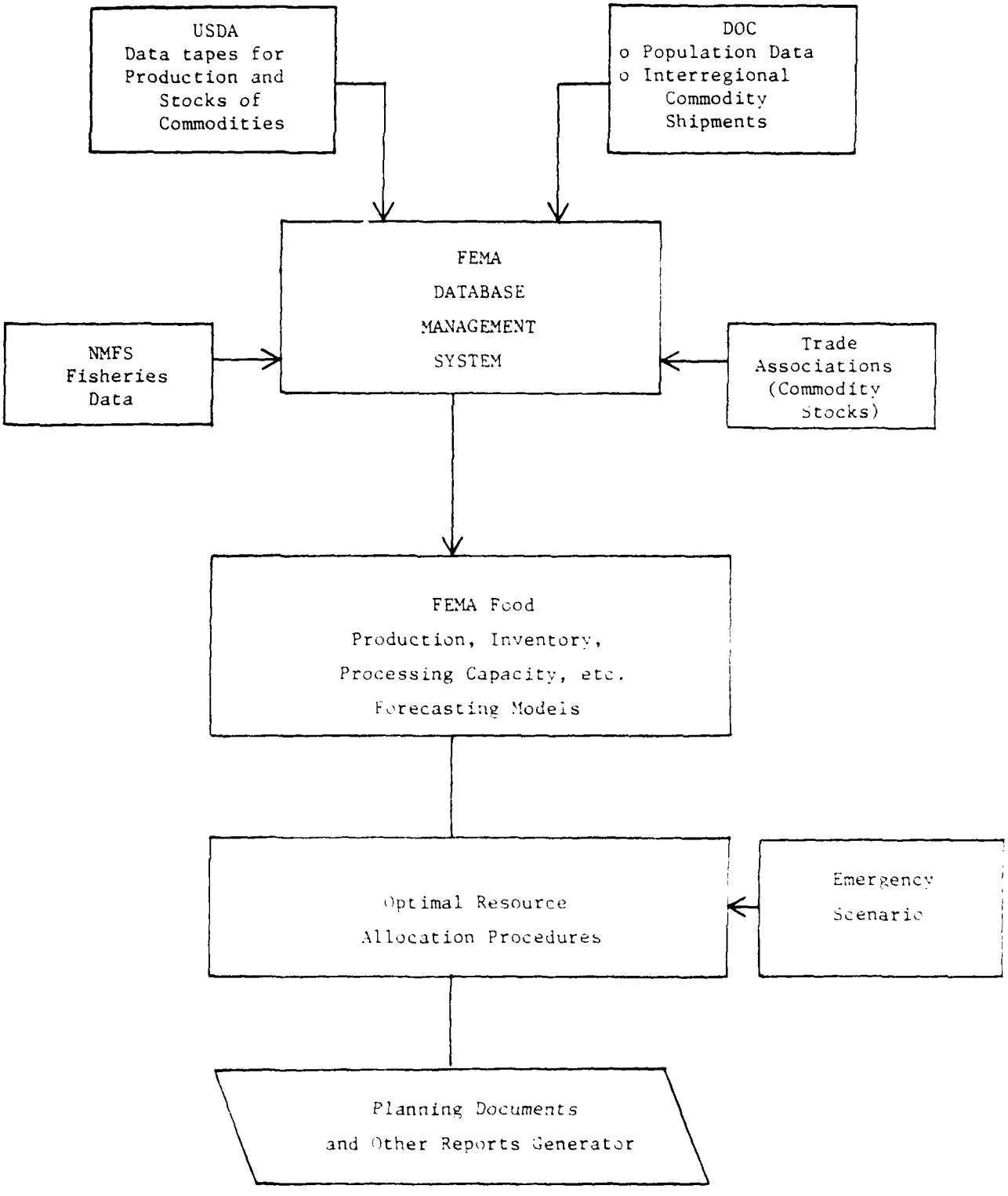
PROBLEMS	SOLUTIONS USED	PREFERRED SOLUTIONS
1. Livestock inventory data available for only a few states.	1. Multiple regression techniques used to estimate inventory.	1. Actual monthly data required for each category for all the states.
2. Most of the data available were on quarterly basis.	2. Intermediate months linearly interpolated.	2. Actual data required for all months.
3. Stocks of commodities held in cold storage are given by USDA regions (different from FEMA regions).	3. The stocks data of USDA regions distributed into the states according to the production in the states. Then re-integrated for FEMA regions.	3. Either the data should be by states or by FEMA regions.
4. Grain stocks data were confidential for some of the states due to avoidance of disclosing of individual operations' secrets.	4. Unallocated grain stocks were distributed evenly among states for which data were not given.	4. Data required for all the states or can be aggregated into FEMA regions to protect confidentiality. secrets.
5. Production data for crops was on annual basis.	5. Monthly production was obtained by multiplying the annual production by a fraction, which was based on assumed percentage harvesting which occurred in the month.	5. The data should be available on monthly basis.
6. Monthly fish landings for a few states not available.	6. The annual state landings were distributed according to the percentage of US landings in each of the 12 months.	6. Monthly data required for each state.

An example of a problem, inconsistent aggregation methods, which was encountered frequently is that data were often reported on a quarterly or annual rather than monthly basis. Also, data were reported for USDA or Department of Commerce regions, which do not correspond to the FEMA regions. Coordination among agencies and private organizations which collect these data would alleviate these problems and provide more useful information for FEMA planning. In general, proper communication between FEMA and the other agencies and organizations would help to ensure that the data is consistent with FEMA's needs. A product of effective inter-agency coordination is the "ADP Food Processing and Distribution Facilities, USDA Database" which is prepared by USDA. Similar databases to satisfy the other data requirements identified above, particularly production and inventory data requirements, are needed.

In order to specify the data requirements and use the data effectively, a database collection, management and use system must be developed. This system should be accurate, complete and easy to use. Exhibit 5-5 shows a schematic of such a system which could be effective in providing the data needed to plan and implement a regional food production, processing and distribution system. The schematic shows the agencies and the data they must provide to the system. As shown, additional feature of an effective system would be models to forecast production, inventory and processing capacity. The next feature of this system would be the regional food production, processing and distribution linear programming and/or other models to determine regional requirements and develop resource allocation plans for various emergency scenarios. The final feature of the system would be a report generator to provide planning and other documents.

EXHIBIT 5- 5

SCHEMATIC OF A DATABASE COLLECTION AND USE SYSTEM



In summary, to prepare a suitable information management and use system for emergency planning, the following steps are recommended:

1. Set up a formal data communication system between FEMA and other agencies to coordinate timely data collection, thereby improving data consistency, accuracy and completeness.

2. An integrated food commodity database should be established. The data should be collected at least at a 4 digit SIC level. The data should be characterized by a product code, month, year, region/state codes, data source and data category (production or stocks).

3. The agencies should prepare the databases and update them periodically.

4. A forecasting system for estimating future product availability should be implemented.

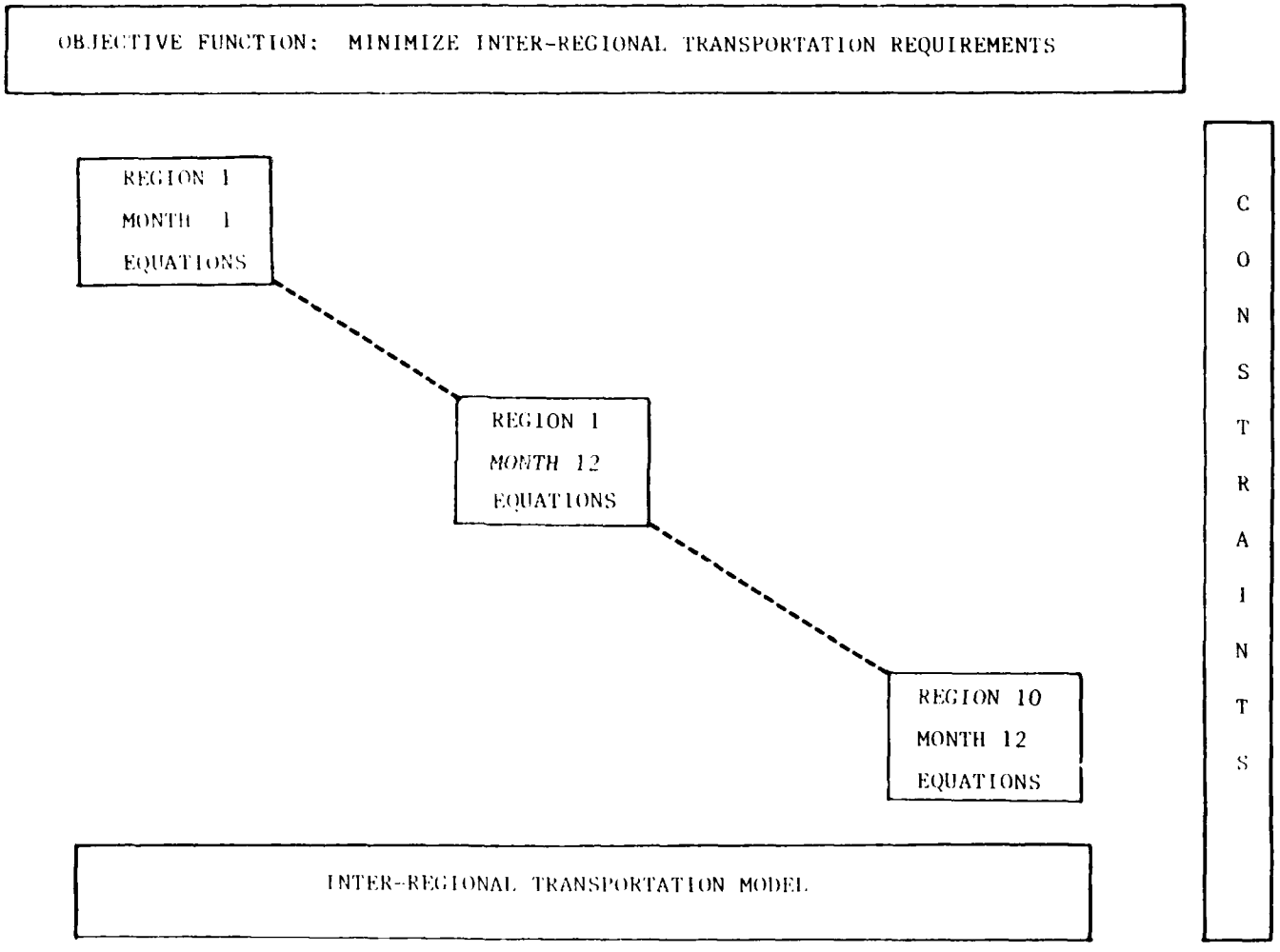
5. An optimal resource allocation procedure should be designed and integrated with the data base management and the forecasting system. This procedure could be an extension of the model used in this analysis. A more comprehensive model may include the following:

   - Products considered at the 4 digit SIC level
   - All regions and months integrated into one national model. A schematic of a national model is shown in Exhibit 5-5. This model would require about 8000 equations with over 20,000 variables.

6. Develop an automated reports and plans generation system.

EXHIBIT 5-6

OVERVIEW OF THE NATIONAL MODEL



APPENDIX A

ABBREVIATIONS USED FOR VARIABLES

AND ROW NAMES IN THE LP MODEL

APPENDIX A - ABBREVIATIONS USED FOR VARIABLES IN THE MODEL

VARIABLE NAME	ABBREVIATION
Grain Production	GRP
Meat Production	MTP
Milk Production	MLP
Veg/fruit Production	VGP
Grain Inventory	GRI
Cattle Inventory	MTI
Milk Inventory	MLI
Veg/fruit Inventory	VGI
Meat Import	MTIM
Veg/fruit Import	VGIM
Milk Import	MLIM
Grain Import	GRIM
Grain Export	GREX
Veg/fruit Export	VGEX
Meat Export	MTEX
Milk Export	MLEX
Processed Meat Inventory	PRMTI
Processed Grain Inventory	PRGRI
Dairy Products Inventory	DARI
Baked Goods Inventory	BAKI
Processed Veg/fruit Inventory	PRVGI
Processed Grain Import	PGRIM
Processed Meat Import	PMTIM
Dairy Products Import	DARIM
Bakery Goods Import	BAKIM
Processed Veg/fruit Import	PVGIM
Processed Grain Export	PGREX
Processed Meat Export	PMTEX
Dairy Products Exports	DAREX
Baked Goods Exports	BAKEX
Processed Veg/fruit Export	PVGEX
Processed Meat Production	PRMT
Processed Grain Production	PRGR
Processed Veg/fruits Production	PRVG
Dairy Production	DAR
Processed Veg/fruits Production	PRVG
Processed Grain Demand	PRGRD
Processed Meat Demand	PRMTD
Processed Veg/fruit Demand	PRVGD
Dairy Products Demand	DARD
Baked Goods Demand	BAKD
Fresh Veg/fruit Demand	FVGD
Energy Requirement	ENRG
Protein Requirement	PROT
Calcium Requirement	CALC
Thiamin Requirement	THI[illegible]
Vitamin C Requirement	VITC
Niacin Requirement	NACN
Riboflavin Requirement	RFLN
Carbohydrates Requirement	CARB[illegible]

APPENDIX A - Continued

ABBREVIATIONS USED FOR ROW NAMES IN THE MODEL

ROW NAME	ABBREVIATION
Grain Balance Equation	GRBE
Grain Production Limit	GRUL
Grain Inventory Limit	GRIL
Meat Balance Equation	MTBE
Meat Production Limit	MTUL
Meat Inventory Limit	MTIL
Veg/fruit Balance Equation	VGBE
Veg/fruit Production Limit	VGUL
Veg/fruit Inventory Limit	VGIL
Milk Balance Equation	MLBE
Milk Production Limit	MLUL
Milk Inventory Limit	MLIL
Processed Meat Balance Equation	PRMTBE
Processed Meat Production Limit	PRMTUL
Processed Meat Inventory Limit	PRMTIL
Processed Grain Balance Equation	PRGRBE
Processed Grain Production Limit	PRGRUL
Processed Grain Inventory Limit	PRGIL
Processed Veg/fruit Balance Equation	PRVGBE
Processed Veg/fruit Production Limit	PRVGUL
Processed Veg/fruit Inventory Limit	PRBGIL
Dairy Products Balance Equation	DARBE
Dairy Products Production Limit	DARUL
Baked Goods Balance Equation	BAKBE
Baked Goods Production Limit	BAKUL
Baked Goods Inventory Limit	BAKIL
Energy Balance Equation	ENRGBE
Energy Upper Limit	ENRGU
Energy Lower Limit	ENRGL
Protein Balance Equation	RPOTBE
Protein Upper Limit	PROTU
Protein Lower Limit	PROTL
Calcium Balance Equation	CALBE
Calcium Upper Limit	CALCU
Calcium Lower Limit	CALCL
Thiomin Balance Equation	THIOBE
Thiomin Upper Limit	THIOU
Thiomin Lower Limit	THIOL
Vitamin C Balance Equation	VITCBE
Vitamin C Upper Limit	VITCU
Vitamin C Lower Limit	VITCL
Niacin Balance Equation	NACNBE
Niacin Upper Limit	NACNU
Niacin Lower Limit	NACNL
Riboflavin Balance Equation	RFLNBE
Riblflavin Upper Limit	RFLNU
Riboflavin Lower Limit	RFLNL
Carbohydrate Balance Equation	CARBOE

ABBREVIATIONS USED FOR ROW NAMES IN THE MODEL - Continued

ROW NAME	ABBREVIATION
Carbohydrate Lower Limit	CARBL
Fresh & Processed Veg/fruit Ratio Contraint	FV/PV
Meat Consumption Lower Limit	MTRL
Veg/Fruit Consumption Lower Limit	VGRL
Grain/Baked Goods Consumption Lower Limit	GRRL
Dairy Products Consumption Lower Limit	DARL

APPENDIX B

INPUT DATA TO THE LP MODEL

APPENDIX B

INTRODUCTION TO INPUT DATA

This section describes the input data to the linear programming model. The data sources, assumptions and procedures are discussed along with detailed data tables. The catagories of data for the LP model are:

1. Production, stocks, and processing capacity
2. Nutritional coefficient (c_{ie}) and Limits (d_e)
3. Population (POP.)
4. Intra-and inter-industry consumption(a_{ij})
5. Losses in distribution to consumers. (b_i)

The sources, assumptions and procedures used in collecting the data, are discussed briefly in Exhibit B-1; Exhibit B-1A lists the regional production, processing capacity and stocks of each commodity. The production, stocks and processing capacity data are characterized by region, month, SIC and type of data (i.e. production or stocks). The stocks of the processed commodities include the stocks held by wholesalers, retailers and consumers. Exhibit B-2 gives the estimated number of days for which the stocks of each food commodity are held by wholesalers, retailers and consumers. Nutritional coefficients and nutrient limits intake used in the analysis are given in Exhibit B-3 and Exhibit B-4 gives the estimated regional population. Intra-and inter-industry consumption cofficients are given in Exhibit B-5; the losses in distribution to consumers are listed in Exhibit B-6.

The data corresponds to the year 1982 unless otherwise specified. The data tables are given by regions and 3 digit SIC, which were integrated from state data given by 4 digit SIC. The units of measurements are millions of pounds.

EXHIBIT B-1

SUMMARY OF INPUT DATA

COMMODITY	SOURCE	ASSUMPTIONS/PROCEDURES
1. Grains (Production and Stocks)	1. "Crop Production" Annual Summary, 1982, Crop Reporting Board, Statistical Reporting Services, USDA 2. All Issues of "Grain Stocks" for 1982 3. "Usual Planting and Harvesting Dates" Field & Seed Crops March 72 Agri. Handbook No.283, SRS, USDA	Production data for each crop was available on an annual basis. Monthly data for each grain and each state was calculated on the basis of the percentage of harvesting that occurred in that month. Grain stocks data was available quarterly for 82. Monthly stocks were obtained by linearly interpolating for the missing months. Grain stocks for a few states were not available due to their confidential operations. Stocks for these states were obtained by distributing equally the unallocated totals among these states.
2. Meat, Fish & Poultry (Production & Stocks)	1."Livestock Slaughter" Jan. 82-Jan. 83. 2. Livestock Slaughter Summary 82 3. "Cattle" Jan. 83 4. "Hogs & Pigs" All reports 82 5."Goats & Sheep" All Reports 82. All reports published-by SRS, CRP, USDA 6. "Fisheries of U.S." 1982, April 83 USDOC, NOAA, National Marine Fisheries Services. 7. Landings for states, North Carolina, South Carolina, Florida, Georgia Alabama, Mississippi, Louisiana, California, Washington, Oregon from NMFS regional offices. 8. "Frozen Fisheries Products" Annual Summary, 1982, US DOC, NOAA, NMFS, April 83. 9. "Poultry Slaughter" Jan 82 - Feb 83. 10. "Eggs Chicken & Turkey" Layers and Egg Production,	Livestock slaughtering data was available as the total numbers slaughtered at the end of each quarter after March 82. The monthly data for Jan. to Dec. 82 was obtained by distributing the number slaughtered quarterly among the months missing data. Inventory data available was not consistent, therefore the following assumptions were made: 1. There is a linear relation between production and inventory of livestock. A linear regression technique was used to generate the inventory data for the states for which no data was available; 2. Inventory is proportional to production quantities for different months of the year. The sheep inventory was available only for Jan 82 Therefore, the relation between production in Jan 82 and inventory on Jan 1, 82 was estimated. The same proportion was used for obtaining inventory data for all other months. In case of absence of monthly data for fish landing for any state, the percentage of fish landings for each month was applied to the annual landings for that state.

COMMODITY	SOURCE	ASSUMPTIONS/PROCEDURES
	CRS, SRS, USDA. 11. "Cold Storage" Annual Summary 1982, March 83, CRB, SRS, USDA	The frozen fish stocks and meat stocks in cold storage were available according to USDA regions (different from FEMA). They were converted to FEMA regions using the assumption that cold storage stocks are proportional to the production in these states.
3. Milk (Production and Dairy Products Stocks)	1. "Milk Production" Jan 83 CRP,SRS, USDA "Milk Production" Jan 82 2. "Cold Storage" Annual Summary, Jan 82, March 83, CRB, SRS USDA.	Quarterly data from April 82 onward was distributed monthly approximately according to the 81 monthly production distribution. Cold storage stocks of dairy products were available for USDA regions. They were converted to FEMA region by distributing the stocks among the states according to milk production in the states.
4. Fruits, Nuts, and Vegetables (Production and Stocks)	1. "Non Citrus Fruits & Nuts" 1982. Annual Summary, Production, Use & Value, Jan 83, CRB,SRS, USDA. 2. "Citrus Fruits" Production Use & Value, 1982-83, September 83. 3. "Vegetables" Annual Summary 82, Production, Use & Value, Jan 83 CRB, SRS, USDA 5. "Estimated Potato Stocks" All Issues of 1982, CRB, SRS USDA 6."Fruits & Tree Nuts" Blooming, Harvesting and Marketing dates, Ag. Handbook No 186 CRS, SRS, USDA 7. "Usual Planting and Harvesting Dates for Fresh market and processing vegetables" AG. Handbook No.507 SRS, USDA 8. "Cold Storage" Annual Summary 1982, CRB, SRS, USDA 9. "Almanac of the Canning, Freezing and Preserving Industries", Edward Judge & Sons, Westminister, MD 1983	For fruits and vegetables, the data for annual production was available for all the states. The monthly production was obtained by multiplying the annual production by the percentage harvested in that month. Potato stocks were assumed to be zero in August and then increasing until December. With this assumption, the distribution of potato stocks for all months was obtained from the stocks data which was available for only 5 months. Stocks data for vegetables and fruits in fresh and processed form was available according to USDA regions, The data was converted to FEMA region by distributing the stocks among states according to the production in the states. Canned and preserved stocks of fruits & vegetables were available for the whole US 4 times a year. The regional distribution was obtained by distributing US total into the regions in proportion to regional production of fruits & vegetables. Missing months were linearly interpolated.

COMMODITY	SOURCE	ASSUMPTIONS/PROCEDURES
5. Processed products (Processing Capacity)	"ADP--Food Processing and Distribution Facilities, U.S.D.A. database."	Aggregated to the FEMA regions and 3-digit SIC level.
6. Processed products (Wholesale, retail, consumer stocks)	SYSTAN, Inc.- wholesale, retail and consumer supplies	These stocks were calculated by multiplying regional population by average daily consumption of each commodity and by the number of days' supply held by wholesalers, retailers, and consumers. See Exhibit B-2 for wholesale, retail, consumer supplies.

EXHIBIT B-1A - PRODUCTION AND STOCK DATA OF FOOD COMMODITIES

PRODUCTION DATA GRAINS (MILLION POUNDS) [illegible]

REGION	ANNUAL PROD	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
REGION 1	77	0	0	0	0	0	0	0	5	58	[illegible]	[illegible]	[illegible]
REGION 2	5851	0	0	0	0	0	30	302	765	53	2295	[illegible]	[illegible]
REGION 3	21846	0	0	0	0	0	1178	1822	473	[illegible]	[illegible]	[illegible]	[illegible]
REGION 4	72995	0	0	0	0	1340	10911	1724	1173	6567	[illegible]	[illegible]	[illegible]
REGION 5	279831	0	0	0	0	0	844	14850	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
REGION 6	82119	0	0	0	0	1469	25528	3266	5845	13058	[illegible]	[illegible]	[illegible]
REGION 7	254182	0	0	0	0	0	24815	15601	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
REGION 8	85362	0	0	0	0	0	607	11173	32240	12530	[illegible]	[illegible]	[illegible]
REGION 9	15438	0	0	0	0	165	554	435	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
REGION 10	27099	0	0	0	0	0	0	2090	3337	[illegible]	[illegible]	[illegible]	[illegible]

NOTE:1. The above data contains wheat, corn, soybean, rice, sorghum, rye, barley and oats

2. The monthly production is based on the percentage of each crop harvested during the month.

Source:1. Crop Production, Annual Summary 1982, Crop Reporting Board, S.R.S.U.S.D.A.1983

2. "Usual Planting and Harvesting dates" Field Crops, U.S.D.A. March 1972 (Agri. Handbook No [illegible])

EXHIBIT B-1A (Continued)

ALL GRAIN STOCKS (MILLION POUNDS) SIC= 011

REGION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
REGION 1	339	359	372	385	357	328	331	335	339	342	341	340
REGION 2	5280	4487	3896	3304	2926	2562	2536	2524	2513	2501	3446	4363
REGION 3	14257	12447	11046	9645	8088	6531	5832	5133	4434	3735	7312	12785
REGION 4	35367	29323	24179	19035	14903	10771	9895	9020	8408	7797	17167	26267
REGION 5	253271	224701	202380	180059	154287	128514	118468	108421	98375	88328	144409	198840
REGION 6	56706	48413	41521	34630	30749	26869	29109	31350	35989	40628	46065	51386
REGION 7	230984	209138	191439	173739	154722	135704	132559	129414	126314	123215	159856	196420
REGION 8	66314	61533	57890	54246	48302	42357	52842	63327	73812	84297	78182	72248
REGION 9	8163	7014	6129	5244	4539	3835	4081	4328	5251	6175	6843	7523
REGION 10	18915	16452	14613	12773	11267	9761	12118	14474	16831	19188	19095	19005

Source: All Issues of "Grain Stocks" for the year 1982 Published by C.R.B. U.S.D.A

EXHIBIT B-1A - (Continued)

ALL MEAT PRODUCTION (MILLION POUNDS) SIC=221

REGION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
REGION 1	87	100	102	96	119	128	148	157	147	126	120	105
REGION 2	87	88	95	87	91	92	90	91	88	88	96	88
REGION 3	521	507	585	525	544	584	557	647	620	618	585	572
REGION 4	1107	1165	1330	1275	1305	1461	1347	1327	1335	1330	1327	1251
REGION 5	1072	1034	1146	1045	1075	1172	1094	1135	1136	1213	1166	1077
REGION 6	969	957	1061	1065	1215	1515	1344	1322	1198	1075	992	951
REGION 7	1971	1817	1935	1771	1822	1929	1848	1902	1858	2121	2022	1938
REGION 8	323	340	390	335	344	364	373	384	373	432	409	397
REGION 9	440	419	438	448	483	513	458	461	456	445	416	403
REGION 10	234	225	254	223	227	237	258	273	247	251	231	214

Source:1."Livestock Slaughter, Jan 82 - Jan 83".and "Annual Summary,1982".

2."Poultry Slaughter,Jan 82- Feb 83. All Issues

3."Eggs, Chickens and Turkeys, Jan 83"

4.Fish Landings data from Regional offices of National Marine Fishery Service.(N.O.A.A)

5.Fisheries of United States,1982, published April,83

Reports 1-3 are published by U.S.D.A. Crop Reporting Board,S.R.S

EXHIBIT B-1A - (Continued)

LIVESTOCK INVENTORIES (MILLION POUNDS) LIVE WEIGHT BIO= 221

REGION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
REGION 1	141	140	150	149	145	140	137	139	144	145	144	131
REGION 2	335	343	344	341	332	323	317	321	326	328	323	314
REGION 3	894	962	1005	995	977	961	945	945	945	946	883	775
REGION 4	1685	1756	1813	1808	1781	1761	1722	1724	1722	1732	1631	1583
REGION 5	2958	3060	3116	3126	3101	3094	3070	3013	2981	2939	2873	2779
REGION 6	2576	2564	2536	2535	2551	2476	2473	2467	2481	2467	2462	2387
REGION 7	5140	5149	5179	5083	5033	5017	5078	5061	5064	5033	5054	4950
REGION 8	2109	2150	2028	2039	2066	2083	2086	2084	2251	2228	2162	1933
REGION 9	1053	1154	1130	1125	1155	1145	1163	1184	1195	1223	1114	971
REGION 10	641	650	629	618	633	628	633	625	602	596	583	490

Source:1.Cattle. January 83.

2. "Hogs and Pigs" All reports for 1982

3. "Goat & Sheep" All Issues for 1982

All reports published by Crop Reporting Board. S.R.S. U.S.D.A

EXHIBIT B-1A - (Continued)

ALL FRUITS, NUTS, POTATOES AND VEGETABLES PRODUCTION DATA (MILLION POUNDS) SIC= 016 & 017

REGION	ANNUAL PROD	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
REGION 1	3670	0	0	0	0	0	1	318	866	1331	846	307	1
REGION 2	4630	0	0	0	0	65	174	541	1120	1399	987	336	1.
REGION 3	3408	0	0	0	1	72	275	465	836	926	670	94	9
REGION 4	6019	361	360	360	669	855	732	607	489	407	456	413	346
REGION 5	11384	0	0	0	0	5	280	1104	2099	3875	2836	799	1
REGION 6	2673	99	96	131	268	402	392	276	263	122	319	208	199
REGION 7	808	0	0	0	0	0	5	30	62	156	514	32	1
REGION 8	4897	0	0	0	0	0	32	318	613	1306	1379	83	7
REGION 9	37092	1338	1428	1698	1904	4046	5421	6428	5398	3820	3353	1539	1321
REGION 10	22286	61	61	0	0	37	139	1291	3519	6392	8336	1150	351

SOURCE: 1. "Vegetables, Annual Summary, 1982"

2. "Citrus Fruits, Annual Summary, 1982"

3. "Non Citrus Fruits and Nuts, 1982-83"

4. Usual Planting and Harvesting Dates for Vegetables

5. Blooming,Harvesting and Marketing Dates for Fruits and Tree Nuts

6. Potatoes and Sweet Potatoes,1982 Annual Summary

7. Usual Planting and Harvesting dates for Potatoes, Handbook

Note: All the above reports are published by Crop Reporting Board,S.R.S.U.S.D.A

EXHIBIT B-1A - (Continued)

FRESH VEGETABLE AND FRUIT STOCKS (MILLION POUNDS) BID= 2168217

REGION	JAN	FEB	MAR	APR	MAY	JUN	JL	AUG	SEP	OCT	NOV	DEC
REGION 1	2079	1735	1413	980	581	638	324	5	688	1384	1908	2533
REGION 2	650	422	273	157	81	64	99	132	380	628	874	1119
REGION 3	492	433	238	166	64	84	99	113	295	488	607	807
REGION 4	74	42	16	11	6	1	24	45	67	80	93	135
REGION 5	1981	1869	1355	906	475	577	305	33	730	1522	2307	3394
REGION 6	3	2	1	0	0	0	0	1	1	2	4	6
REGION 7	160	157	135	73	23	48	25	1	49	97	144	191
REGION 8	2266	1871	1469	987	452	651	326	1	662	1328	1934	2682
REGION 9	1953	1222	507	566	644	776	963	1143	1527	1856	1765	1916
REGION 10	10918	9311	7674	6046	4170	4111	2229	345	3589	6762	9535	13128

Source: "Potato Stocks" All Issues of 1982 and Annual Cold Storage Summary.1982

"Cold Storage' Annual Summary. 1982

Above Reports are published by C.R.P.S.R.S. U.S.D.A

EXHIBIT B-1A - (Continued)

MILK PRODUCTION (MILLION POUNDS) BIO= 034

REGION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
REGION 1	339	328	362	397	354	322	337	326	347	360	328	362
REGION 2	963	892	1020	1154	1029	936	946	917	975	936	845	966
REGION 3	1102	1048	1131	1271	1133	1030	1101	1066	1135	1167	1222	1167
REGION 4	986	939	1060	1143	1019	987	946	917	974	1029	882	1029
REGION 5	3907	3652	4139	4743	4230	3845	3953	3833	4073	3962	3413	3983
REGION 6	630	594	675	651	580	538	529	513	545	571	492	571
REGION 7	711	651	721	820	731	665	712	668	731	730	626	702
REGION 8	446	426	463	526	469	426	456	442	470	446	382	446
REGION 9	1311	1205	1367	1515	1352	1229	1358	1317	1399	1377	1181	1377
REGION 10	529	487	555	640	571	519	586	569	604	579	496	573

SOURCE: MILK PRODUCTION ANNUAL SUMMARY, 1982, CROP REPORTING BOARD,S.R.S.U.S.D.A

MILK PRODUCTION, JANUARY 1982

EXHIBIT B-1A (Continued)

ALL MEAT COLD STORAGE STOCK (MILLION POUNDS) SID= 201

REGION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
REGION 1	366	381	333	330	335	341	358	372	385	387	391	387
REGION 2	495	490	496	493	494	501	515	526	525	519	506	490
REGION 3	634	621	606	636	644	671	709	745	780	744	712	673
REGION 4	891	881	876	894	894	910	931	951	969	952	939	885
REGION 5	1176	1166	1145	1173	1201	1230	1244	1259	1274	1252	1237	1195
REGION 6	673	663	679	681	679	685	692	699	705	691	684	677
REGION 7	536	512	493	510	527	544	550	557	564	550	533	522
REGION 8	170	166	164	165	166	167	169	172	175	173	171	169
REGION 9	872	838	794	803	817	833	878	920	954	951	948	933
REGION 10	252	242	230	232	235	240	254	268	277	277	275	271

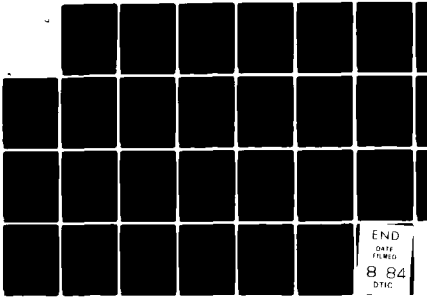
NOTE:- THE DATA INCLUDES THE WHOLESALE, RETAIL AND CONSUMER STOCKS

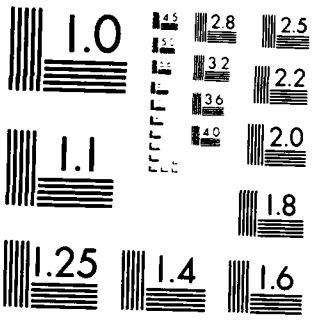
Source:"Cold Storage, Annual Summary, 1982." Crop Reporting Board.S.R.S.U.S.D.A.

AD-A142 453 ESTIMATION OF CRITICAL POPULATION SUPPORT REQUIREMENTS (U) ENGINEERING AND ECONOMICS RESEARCH INC VIENNA VA R A CABRAAL ET AL. 30 MAY 84 EER-TR-008-84

2/2

UNCLASSIFIED EMW-83-R-1266 F/G 15/3 NL





MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS 1963-A

EXHIBIT B-1A (Continued)

ALL FRUITS AND VEGETABLE STOCKS IN PROCESSED FORM (MILLION POUNDS) SIC= 203

REGION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
REGION 1	1074	1077	1070	1285	1269	1032	1352	1461	1263	1663	1621	1125
REGION 2	2014	1995	1964	1938	1918	1836	1941	1993	2066	2156	2091	2055
REGION 3	2364	2463	2492	2613	2618	2517	2618	2625	2339	2712	2666	2350
REGION 4	3831	3961	4010	4281	4277	4019	4241	4227	3642	4406	4374	3798
REGION 5	3974	3902	3836	3826	3781	3657	3872	4031	4179	4469	4317	4146
REGION 6	2100	2092	2079	2211	2198	2053	2261	2343	2285	2488	2451	2093
REGION 7	874	869	864	1022	1016	854	1085	1161	884	1254	1243	883
REGION 8	701	704	684	912	892	636	974	1088	705	1317	1253	709
REGION 9	3850	3766	3538	3067	2944	3107	2916	3090	4351	4099	3529	4157
REGION 10	1665	1676	1577	1514	1453	1380	1427	1510	1791	2117	1798	1759

NOTE: Wholesale and retail and consumers stocks are included

Source: 1. Annual Cold Storage Summary. 1982. U.S.D.A. Crop Reporting Board

2. Almanac of the Canning, Freezing and Preserving Industries.

Edward Judge & Sons, Westminister, MD 1983

EXHIBIT B-1A - (Continued)

PROCESSED GRAIN STOCK (MILLION POUND Date: 2-15-84 SID= 324

REGION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
REGION 1	49	49	49	49	49	49	49	49	49	49	49	49
REGION 2	133	133	133	134	135	136	136	135	135	137	139	142
REGION 3	109	109	109	109	110	110	110	110	109	110	111	112
REGION 4	228	230	232	232	233	232	230	229	230	232	234	235
REGION 5	270	269	268	272	275	278	276	275	273	279	285	288
REGION 6	446	504	531	522	523	488	448	398	439	461	472	472
REGION 7	121	121	120	122	124	126	124	121	122	127	133	133
REGION 8	32	32	32	32	32	32	32	32	32	32	33	33
REGION 9	266	306	335	347	371	375	383	400	349	322	304	293
REGION 10	48	48	48	49	49	50	49	49	49	52	51	52

Data obtained from CURRENT INDUSTRIAL REPORTS FLOUR MILLING PRODUCTS DECEMBER 1982.
Values obtained for Mar.June.Sept.Dec 1982.Intermediate monthly data interpolated.
Assumes stocks distributed in same proportions as production.

EXHIBIT B-1A - (Continued)

DAIRY STOCKS: COLD STORAGE AND DRY MILK (MILLION POUNDS) SIC= 202

REGION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
REGION 1	57	57	56	55	55	55	55	56	56	56	57	57
REGION 2	161	162	170	174	178	181	178	175	171	170	168	167
REGION 3	159	159	165	169	173	177	175	173	171	169	168	167
REGION 4	186	181	177	181	184	188	189	190	191	194	197	200
REGION 5	818	817	844	886	926	967	961	955	949	955	960	965
REGION 6	154	156	155	153	150	148	143	139	134	134	134	134
REGION 7	190	191	189	203	218	232	234	236	239	246	253	260
REGION 8	100	100	99	103	108	113	114	115	116	119	121	124
REGION 9	165	166	169	171	173	174	177	179	181	182	183	184
REGION 10	70	71	71	72	73	74	75	76	77	78	79	79

DRY MILK
STOCKS US*

* Stock data from AMERICAN DRY MILK INSTITUTE.INC MONTHLY STATISTICAL REPORT SEPTEMBER 1983
Values obtained for Jan.Feb.Mar.Jun.Sept.Dec 1982.
Data except Dec includes nonfat dry milk,dry whole milk,human food dried buttermilk;Dec.nonfat dry milk only.

Other source was "Cold Storage Annual Summary, 1982" C.R.P..S.R.S. U.S.D.A

NOTE : The above data includes the stocks held at wholesale, retail and consumer levels

EXHIBIT B-1A - (Continued)

WHOLESALE AND RETAIL STOCK OF BAKERY MILL PRODUCTS (MILLION POUNDS) SIC =225

REGION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
REGION 1	12	12	12	12	12	12	12	12	12	12	12	12
REGION 2	24	24	24	24	24	24	24	24	24	24	24	24
REGION 3	23	23	23	23	23	23	23	23	23	23	23	23
REGION 4	39	39	39	39	39	39	39	39	39	39	39	39
REGION 5	44	44	44	44	44	44	44	44	44	44	44	44
REGION 6	25	25	25	25	25	25	25	25	25	25	25	25
REGION 7	11	11	11	11	11	11	11	11	11	11	11	11
REGION 8	7	7	7	7	7	7	7	7	7	7	7	7
REGION 9	27	27	27	27	27	27	27	27	27	27	27	27
REGION 10	8	8	8	8	8	8	8	8	8	8	8	8

Note: The above cata consists of only wholesalers. retailers and consumers stock

As other stock data was not available

EXHIBIT B-1A (Continued)

MONTHLY PRODUCTION CAPACITIES OF VARIOUS PROCESSING INDUSTRIES (MILLION POUNDS)

INDUSTRY	REG 1	REG 2	REG 3	REG 4	REG 5	REG 6	REG 7	REG 8	REG 9	REG 10
MEAT PRODUCTS SIC= 201	177	583	2452	1962	1414	1157	1220	307	1099	221
DAIRY PRODUCTS SIC=202	1832	2978	2209	5206	10925	1722	1863	1557	2755	1832
FRUITS & VEG. PROCESSINGS SIC=203	90	212	418	1176	3673	317	21	157	3024	3870
GRAIN MILL PROD SIC=204	14	378	259	141	1615	593	395	211	150	186
BAKERY PRODUCTS SIC=205	47	422	154	323	598	94	476	453	410	356

Source: ADP- Food Processing and Distribution Facilities, U.S.D.A database

Note: The above data is based on 40 hours/week plant operation

EXHIBIT B-2 ESTIMATED DAY'S SUPPLY OF VARIOUS COMMODITIES

HELD BY

WHOLESALERS, RETAILERS & COMSUMERS

(current consumption levels)

	Meat	Milk	Eggs	Cereals		Fruits & Vegetables		Fats & Oils	Potatoes	Sugar
				Bread	Cereal Products	Fresh	Processed			
Wholesale (Days)	4	2	3.5	1	20	3	20	20	6	20
Retail (Days)	4	1	3	1	14	2	14	14	3	14
Consumer (Days)	2.5	1.5	4	1	9	2	6	9	5	8

Source: SYSTAN, Inc. - Assembled from
Industry Interviews and USDA publications

EXHIBIT B-3 NUTRITIONAL COEFFICIENTS AND NUTRIENT INTAKE LIMITS FOR THE LP MODEL

NUTRIENT	COEFFICIENTS* (Per Million Pounds)						LIMITS (Per Million Population)	
	MEAT PRODUCTS	DAIRY PRODUCTS	FRESH VEG/FRUITS	PROCESSED GRAIN PRODUCTS	BAKED GOODS	PROCESSED VEG/FRUIT	MINIMUM**	MAXIMUM***
ENERGY Billions KCal	1.099	.398	.333	1.121	1.337	.375	54	117
PROTEIN Millions Kg	.109	.021	.008	.021	.036	.006	1.5	5.35
CALCIUM Thousand Kg	.073	.747	.098	.165	.279	.074	9	72
THIAMIN Kg	.92	.18	.33	2.4	1.47	.33	15	135
VITAMIN C Kg	.17	3.51	75.26	75.2	0	121	300	3400
NIACIN Kg	23.1	.36	4.32	29.5	11.9	3.3	150	1710
RIBOFLAVIN Kg	.98	.84	.26	2.17	1.01	.16	30	153
CARBOHYDRATES Kg	.002	.027	.064	.231	.247	.075	5.25	-

Source: U.S.Department of Agriculture, Nutritive Value of Foods, Home and Garden Bulletin Number 72, April 1981

*Coefficents were based on weighted averages of foods within each group (e.g for meat: beef, pork, chicken etc.) according to peacetime consumption pattern.

**From Franz & Kearney "Maintaining Nutritional Adequacy...." p.4.Planning Period up to 3 weeks

***Values for all the nutrients except energy are three times the Recommended Daily Allowances (RDA's) developed by the National Academy of Sciences
The maximum energy value is the maximum recommended by N.A.S.

EXHIBIT B-4

POPULATION DATA
(MILLIONS)

REGION	POPULATION
REGION 1	12.49
REGION 2	25.1
REGION 3	24.11
REGION 4	40.1
REGION 5	45.72
REGION 6	26.5
REGION 7	11.85
REGION 8	7.26
REGION 9	28.46
REGION 10	7.86
UNITED STATES	229.45

SOURCE: U.S. DEPARTMENT OF COMMERCE, BUREAU OF CENSUS ESTIMATES OF THE POPULATION OF STATES, BY AGE: JULY 1, 1981, AND 1982.

EXHIBIT B-5

INTRA- AND INTER-INDUSTRY CONSUMPTION COEFFICIENTS
(LB PRIMARY PRODUCT /LB PROCESSED PRODUCT)

PRIMARY PRODUCTS	PROCESSED MEAT	DAIRY	PROCESSED FRUIT/VEG	PROCESSED GRAIN	BAKERY INDUSTRY
GRAIN				1.3	
MEAT	1.17				
MILK		1.9			
FRUITS/VEG			1.79		
PROCESSED GRAIN				-.96	1.3
PROCESSED MEAT	-.84				.04
PROCESSED FRUIT/VEG			-1		
DAIRY PRODUCTS		-.86			.02
BAKED GOODS					

Sources: (a) U.S. Department of Commerce, Bureau of Census, 1977 Census of Manufactures, Volume II Industry Statistics
(b) Almanac of the Canning, Freezing and Preserving Industries, Edward Judge & Sons 1983.
(c) U.S. Department of Agriculture, Statistical Reporting Service "Dairy Products Annual Summary 1982"

Coefficients were based on:
(a) the ratio of materials consumed to shipments;
(b) a weighted average of values from from the Almanac; and
(c) the ratio of dairy products production to milk production.

EXHIBIT B-6

Estimates of Food Losses During Distribution

Food Product Group	Losses	Product Group's Proportion of Super-Market Food Sales
	(percent)	(percent)
Fresh Beef	4.8	13.4
Produce	9.04 - 16.61	9.8
Dairy Products	.63 - 3.50	15.2
Dry Grocery	.382	36.2
Frozen Foods	.98 - 2.85	8.1
Bakery Goods	1.05 - 12.48	4.7
Deli Foods	4.91 - 7.40	5.2
Totals:	1.77 - 3.60[1/]	92.6

[1/] These figures are based upon a range of 1977 dollar losses--$1,590 to $3.234 billion -- as a percentage of 1977 total supermarket food sales.

Source:

Thomas R. Pierson, et al, Losses in U.S. Food Distribution System Food Losses, Overview and Summary Agricultural Economics Report 421, Department of Agricultural Economics, Michigan State University December 1982.

APPENDIX C

RESULTS OF THE LP ANALYSIS

APPENDIX C - RESULTS OF THE LP ANALYSIS

ANALYSIS OF LP MODEL OUTPUT FOR REGION 1

		FOOD INDUSTRIES OUTPUT (MILLION POUNDS)									
MONTH	FOOD ITEMS	AVAIL. PROD.	AVAIL. INVENT	AVAIL. TOTAL	REQD. IMPORT	REQD. PROD.	REQD. INVENT.	REQD. TOTAL	EXCESS	CAPACITY UTILIZ.	CONS. (LBS) /PER/MONTH
JANUARY	MILK	339	0	339	0	N.A	N.A	339	0	N.A	.00
FEBRUARY		328	0	328	0	N.A	N.A	328	0	N.A	.00
MARCH		362	0	362	0	N.A	N.A	362	0	N.A	.00
APRIL		397	0	397	0	N.A	N.A	397	0	N.A	.00
MAY		354	0	354	0	N.A	N.A	354	0	N.A	.00
JUNE		322	0	322	0	N.A	N.A	322	0	N.A	.00
JULY		337	0	337	0	N.A	N.A	337	0	N.A	.00
AUGUST		327	0	327	0	N.A	N.A	327	0	N.A	.00
SEPTEMBER		347	0	347	0	N.A	N.A	347	0	N.A	.00
OCTOBER		360	0	360	0	N.A	N.A	360	0	N.A	.00
NOVEMBER		308	0	308	0	N.A	N.A	308	0	N.A	.00
DECEMBER		360	0	360	0	N.A	N.A	360	0	N.A	.00
JANUARY	FRUIT/VEG	0	2079	2079	0	N.A	N.A	298	1762	N.A	20.83
FEBRUARY		0	1735	1735	0	N.A	N.A	298	1438	N.A	20.83
MARCH		0	1413	1413	0	N.A	N.A	298	1116	N.A	20.83
APRIL		0	980	980	0	N.A	N.A	298	683	N.A	20.83
MAY		0	581	581	0	N.A	N.A	298	284	N.A	20.83
JUNE		1	638	639	0	N.A	N.A	298	342	N.A	20.83
JULY		318	324	642	0	N.A	N.A	318	324	N.A	20.83
AUGUST		866	9	875	0	N.A	N.A	445	430	N.A	20.83
SEPTEMBER		1331	628	1959	0	N.A	N.A	445	1514	N.A	20.83
OCTOBER		846	1284	2130	0	N.A	N.A	445	1685	N.A	20.83
NOVEMBER		307	1938	2245	0	N.A	N.A	307	1938	N.A	20.83
DECEMBER		0	2593	2593	0	N.A	N.A	298	2296	N.A	20.83
JANUARY	GRAIN	0	339	339	0	N.A	N.A	18	321	N.A	.00
FEBRUARY		0	359	359	0	N.A	N.A	18	341	N.A	.00
MARCH		0	372	372	0	N.A	N.A	18	354	N.A	.00
APRIL		0	385	385	0	N.A	N.A	18	367	N.A	.00
MAY		0	357	357	0	N.A	N.A	18	339	N.A	.00
JUNE		0	328	328	0	N.A	N.A	18	310	N.A	.00
JULY		0	331	331	0	N.A	N.A	18	313	N.A	.00
AUGUST		8	335	343	0	N.A	N.A	18	325	N.A	.00
SEPTEMBER		58	339	397	0	N.A	N.A	18	379	N.A	.00
OCTOBER		12	342	354	0	N.A	N.A	18	336	N.A	.00
NOVEMBER		0	341	341	0	N.A	N.A	18	323	N.A	.00
DECEMBER		0	340	340	0	N.A	N.A	18	322	N.A	.00

APPENDIX C - (Continued)

ANALYSIS OF LP MODEL OUTPUT FOR REGION 1

		FOOD INDUSTRIES OUTPUT (MILLION POUNDS)									
MONTH	FOOD ITEMS	AVAIL. PROD.	AVAIL. INVENT	AVAIL. TOTAL	REQD. IMPORT	REQD. PROD.	REQD. INVENT.	REQD. TOTAL	EXCESS	CAPACITY UTILIZ.	CONS.(LBS) /PER/MONTH
JANUARY	MEAT	87	141	228	0	N.A	N.A	12	216	N.A	.00
FEBRUARY		100	140	240	0	N.A	N.A	0	240	N.A	.00
MARCH		102	150	252	0	N.A	N.A	58	194	N.A	.00
APRIL		96	149	245	0	N.A	N.A	62	183	N.A	.00
MAY		119	145	264	0	N.A	N.A	55	209	N.A	.00
JUNE		128	140	268	0	N.A	N.A	47	222	N.A	.00
JULY		148	137	285	0	N.A	N.A	23	262	N.A	.00
AUGUST		157	139	296	0	N.A	N.A	3	293	N.A	.00
SEPTEMBER		147	144	291	0	N.A	N.A	0	291	N.A	.00
OCTOBER		126	145	271	0	N.A	N.A	0	271	N.A	.00
NOVEMBER		120	144	264	0	N.A	N.A	0	264	N.A	.00
DECEMBER		106	131	237	0	N.A	N.A	0	237	N.A	.00
JANUARY	BAKED GOODS	47	12	59	79	0	12	91	-32	0	6.65
FEBRUARY		47	12	59	79	0	12	91	-32	0	6.85
MARCH		47	12	59	79	0	12	91	-32	0	6.85
APRIL		47	12	59	79	0	12	91	-32	0	6.85
MAY		47	12	59	79	0	12	91	-32	0	6.85
JUNE		47	12	59	79	0	12	91	-32	0	6.85
JULY		47	12	59	79	0	12	91	-32	0	6.85
AUGUST		47	12	59	79	0	12	91	-32	0	6.85
SEPTEMBER		47	12	59	79	0	12	91	-32	0	6.85
OCTOBER		47	12	59	79	0	12	91	-32	0	6.85
NOVEMBER		47	12	59	79	0	12	91	-32	0	6.85
DECEMBER		47	12	59	79	0	12	91	-32	0	6.85
JANUARY	DAIRY PROD.	1832	57	1889	41	178	57	277	1612	10	19.75
FEBRUARY		1832	57	1889	46	173	57	276	1613	9	19.75
MARCH		1832	56	1888	32	191	56	278	1610	10	19.75
APRIL		1832	55	1887	17	209	55	281	1606	11	19.75
MAY		1832	55	1887	36	186	55	278	1609	10	19.75
JUNE		1832	55	1887	51	170	55	275	1612	9	19.75
JULY		1832	55	1887	44	177	55	277	1611	10	19.75
AUGUST		1832	56	1888	48	172	56	276	1612	9	19.75
SEPTEMBER		1832	56	1888	39	183	56	277	1611	10	19.75
OCTOBER		1832	56	1888	33	190	56	278	1610	10	19.75
NOVEMBER		1832	57	1889	55	162	57	274	1615	9	19.75
DECEMBER		1832	57	1889	32	190	57	278	1611	10	19.75

ANALYSIS OF LP MODEL OUTPUT FOR REGION 1

		FOOD INDUSTRIES OUTPUT (MILLION POUNDS)									
MONTH	FOOD ITEMS	AVAIL. PROD.	AVAIL. INVENT	AVAIL. TOTAL	REQD. IMPORT	REQD. PROD.	REQD. INVENT.	REQD. TOTAL	EXCESS	CAPACITY UTILIZ.	CONS. (LBS) /PER/MONTH
JANUARY	PR-FRUIT/VEG	90	1074	1164	0	0	82	82	1082	0.	6.53
FEBRUARY		90	1077	1167	0	0	82	82	1085	0.	6.53
MARCH		90	1070	1160	0	0	82	82	1078	0.	6.53
APRIL		90	1285	1375	0	0	82	82	1293	0	6.53
MAY		90	1269	1359	0	0	82	82	1277	0	6.53
JUNE		90	1032	1122	0	0	82	82	1040	0	6.53
JULY		90	1352	1442	0	12	71	82	1360	13.	6.53
AUGUST		90	1461	1551	0	82	0	82	1469	92.	6.53
SEPTEMBER		90	1083	1173	0	82	0	82	1091	92	6.53
OCTOBER		90	1663	1753	0	82	0	82	1671	92	6.53
NOVEMBER		90	1621	1711	0	5	77	82	1629	6	6.53
DECEMBER		90	1108	1198	0	0	82	82	1116	0	6.53
JANUARY	PR-GRAIN	14	49	63	0	14	49	63	0	100	5.00
FEBRUARY		14	49	63	0	14	49	63	0	100	5.00
MARCH		14	49	63	0	14	49	63	0	100	5.00
APRIL		14	49	63	0	14	49	63	0	100	5.00
MAY		14	49	63	0	14	49	63	0	100	5.00
JUNE		14	49	63	0	14	49	63	0	100	5.00
JULY		14	49	63	0	14	49	63	0	100.	5.00
AUGUST		14	49	63	0	14	49	63	0	100	5.00
SEPTEMBER		14	49	63	0	14	49	63	0	100	5.00
OCTOBER		14	49	63	0	14	49	63	0	100	5.00
NOVEMBER		14	49	63	0	14	49	63	0	100	5.00
DECEMBER		14	49	63	0	14	49	63	0	100	5.00
JANUARY	PR-MEAT	177	366	543	0	10	366	376	167	6	19.98
FEBRUARY		177	381	558	0	0	374	374	184	0	19.98
MARCH		177	333	510	0	49	333	382	128	28	19.98
APRIL		177	330	507	0	53	330	383	124	30	19.98
MAY		177	335	512	0	47	335	382	130	26	19.98
JUNE		177	341	518	0	40	341	381	137	22	19.98
JULY		177	358	535	0	20	358	378	158	11	19.98
AUGUST		177	372	549	0	3	372	375	174	2	19.98
SEPTEMBER		177	385	562	0	0	374	374	188	0	19.98
OCTOBER		177	387	564	0	0	374	374	190	0	19.98
NOVEMBER		177	391	568	0	0	374	374	194	0	19.98
DECEMBER		177	387	564	0	0	374	374	190	0	19.98

APPENDIX C - (Continued)

ANALYSIS OF LP MODEL OUTPUT FOR REGION 2

		FOOD INDUSTRIES OUTPUT (MILLION POUNDS)									
MONTH	FOOD ITEMS	AVAIL. PROD.	AVAIL. INVENT	AVAIL. TOTAL	REQD. IMPORT	REQD. PROD.	REQD. INVENT.	REQD. TOTAL	EXCESS	CAPACITY UTILIZ.	CONS. (LBS) /PER/MONTH
JANUARY	MILK	963	0	963	0	N.A	N.A	963	0	N.A	.00
FEBRUARY		892	0	892	0	N.A	N.A	892	0	N.A	.00
MARCH		1020	0	1020	0	N.A	N.A	668	352	N.A	.00
APRIL		1154	0	1154	0	N.A	N.A	679	475	N.A	.00
MAY		1029	0	1029	0	N.A	N.A	654	375	N.A	.00
JUNE		936	0	936	0	N.A	N.A	635	301	N.A	.00
JULY		946	0	946	0	N.A	N.A	946	0	N.A	.00
AUGUST		917	0	917	0	N.A	N.A	917	0	N.A	.00
SEPTEMBER		975	0	975	0	N.A	N.A	975	0	N.A	.00
OCTOBER		986	0	986	0	N.A	N.A	986	0	N.A	.00
NOVEMBER		845	0	845	0	N.A	N.A	845	0	N.A	.00
DECEMBER		986	0	986	0	N.A	N.A	986	0	N.A	.00
JANUARY	FRUIT/VEG	0	650	650	0	N.A	N.A	650	0	N.A	22.72
FEBRUARY		0	422	422	0	N.A	N.A	412	10	N.A	14.41
MARCH		0	273	273	101	N.A	N.A	374	-101	N.A	13.06
APRIL		0	157	157	217	N.A	N.A	374	-217	N.A	13.06
MAY		65	81	146	228	N.A	N.A	374	-228	N.A	13.06
JUNE		174	64	238	136	N.A	N.A	374	-136	N.A	13.05
JULY		541	99	640	0	N.A	N.A	541	99	N.A	18.91
AUGUST		1120	132	1252	0	N.A	N.A	1066	186	N.A	24.91
SEPTEMBER		1339	380	1719	0	N.A	N.A	1169	550	N.A	27.59
OCTOBER		967	638	1605	0	N.A	N.A	879	726	N.A	20.53
NOVEMBER		336	874	1210	0	N.A	N.A	419	791	N.A	14.65
DECEMBER		31	1120	1151	0	N.A	N.A	434	717	N.A	15.18
JANUARY	GRAIN	0	5280	5280	0	N.A	N.A	491	4789	N.A	.00
FEBRUARY		0	4487	4487	0	N.A	N.A	491	3996	N.A	.00
MARCH		0	3896	3896	0	N.A	N.A	491	3405	N.A	.00
APRIL		0	3304	3304	0	N.A	N.A	491	2813	N.A	.00
MAY		0	2926	2926	0	N.A	N.A	491	2435	N.A	.00
JUNE		30	2562	2592	0	N.A	N.A	491	2101	N.A	.00
JULY		302	2536	2838	0	N.A	N.A	491	2347	N.A	.00
AUGUST		769	2524	3293	0	N.A	N.A	491	2802	N.A	.00
SEPTEMBER		58	2513	2571	0	N.A	N.A	491	2080	N.A	.00
OCTOBER		2095	2501	4596	0	N.A	N.A	491	4105	N.A	.00
NOVEMBER		2596	3446	6042	0	N.A	N.A	491	5551	N.A	.00
DECEMBER		0	4363	4363	0	N.A	N.A	491	3872	N.A	.00

ANALYSIS OF LP MODEL OUTPUT FOR REGION 2

		FOOD INDUSTRIES OUTPUT (MILLION POUNDS)									
MONTH	FOOD ITEMS	AVAIL. PROD.	AVAIL. INVENT	AVAIL. TOTAL	REQD. IMPORT	REQD. PROD.	REQD. INVENT.	REQD. TOTAL	EXCESS.	CAPACITY UTILIZ.	CONS. (LBS) PER/MONTH
JANUARY	MEAT	87	335	422	0	N.A	N.A	87	335	N.A	.00
FEBRUARY		88	343	431	0	N.A	N.A	51	381	N.A	.00
MARCH		95	344	439	0	N.A	N.A	329	110	N.A	.00
APRIL		87	341	428	0	N.A	N.A	331	97	N.A	.00
MAY		91	332	423	0	N.A	N.A	328	95	N.A	.00
JUNE		92	323	415	0	N.A	N.A	317	98	N.A	.00
JULY		90	317	407	0	N.A	N.A	90	317	N.A	.00
AUGUST		91	321	412	0	N.A	N.A	91	321	N.A	.00
SEPTEMBER		92	326	418	0	N.A	N.A	92	326	N.A	.00
OCTOBER		98	328	426	0	N.A	N.A	98	328	N.A	.00
NOVEMBER		96	323	419	0	N.A	N.A	96	323	N.A	.00
DECEMBER		93	314	407	0	N.A	N.A	93	314	N.A	.00
JANUARY	BAKED GOODS	422	24	446	0	0	24	24	422	0	.00
FEBRUARY		422	24	446	0	0	24	24	422	0	.00
MARCH		422	24	446	0	381	24	405	41	90	15.24
APRIL		422	24	446	0	382	24	406	40	91	15.27
MAY		422	24	446	0	383	24	407	39	91	15.29
JUNE		422	24	446	0	384	24	408	38	91	15.33
JULY		422	24	446	0	0	24	24	422	0	.00
AUGUST		422	24	446	0	0	24	24	422	0	.00
SEPTEMBER		422	24	446	0	0	0	0	446	0	.00
OCTOBER		422	24	446	0	0	24	24	422	0	.00
NOVEMBER		422	24	446	0	0	24	24	422	0	.00
DECEMBER		422	24	446	0	0	24	24	422	0	.00
JANUARY	DAIRY PROD.	2978	161	3139	0	507	161	668	2471	17	23.31
FEBRUARY		2978	162	3140	0	470	162	632	2509	16	22.10
MARCH		2978	170	3148	0	352	170	522	2627	12	17.14
APRIL		2978	174	3152	0	357	174	531	2621	12	17.14
MAY		2978	178	3156	0	344	178	522	2634	12	17.13
JUNE		2978	181	3159	0	334	181	515	2644	11	17.13
JULY		2978	178	3156	0	498	178	676	2480	17	23.68
AUGUST		2978	175	3153	0	483	175	658	2495	16	23.05
SEPTEMBER		2978	171	3149	0	513	171	684	2465	17	23.92
OCTOBER		2978	170	3148	0	519	170	689	2459	17	24.87
NOVEMBER		2978	168	3146	0	445	168	613	2533	15	21.50
DECEMBER		2978	167	3145	0	519	167	686	2459	17	23.96

APPENDIX C - (Continued)

ANALYSIS OF LP MODEL OUTPUT FOR REGION 2

		FOOD INDUSTRIES OUTPUT (MILLION POUNDS)									
MONTH	FOOD ITEMS	AVAIL. PROD.	AVAIL. INVENT	AVAIL. TOTAL	REQD. IMPORT	REQD. PROD.	REQD. INVENT.	REQD. TOTAL	EXCESS	CAPACITY UTILIZ.	CONS. (LBS) /PER/MONTH
JANUARY	PR-FRUIT/VEG	212	2014	2226	0	0	180	180	2046	8	7.12
FEBRUARY		212	1995	2207	0	0	114	114	2093	0	4.52
MARCH		212	1964	2176	0	0	103	103	2073	0	4.28
APRIL		212	1938	2150	0	0	103	103	2047	0	4.28
MAY		212	1918	2130	0	0	103	103	2027	0	4.28
JUNE		212	1896	2108	0	0	103	103	2005	0	4.28
JULY		212	1941	2153	0	0	150	150	2003	0	5.91
AUGUST		212	1993	2205	0	197	0	197	2008	93	7.73
SEPTEMBER		212	2066	2278	0	212	7	219	2059	120	8.62
OCTOBER		212	2156	2368	0	163	0	163	2205	77	6.42
NOVEMBER		212	2091	2303	0	0	116	116	2187	0	4.56
DECEMBER		212	2055	2267	0	0	120	120	2147	0	4.74
JANUARY	PR-GRAIN	378	133	511	0	378	133	511	0	100	19.76
FEBRUARY		378	133	511	0	378	133	511	0	100	19.76
MARCH		378	133	511	0	378	133	511	0	100	.00
APRIL		378	134	512	0	378	134	512	0	100	.00
MAY		378	135	513	0	378	135	513	0	100	.00
JUNE		378	136	514	0	378	136	514	0	100	.00
JULY		378	136	514	0	378	136	514	0	100	19.88
AUGUST		378	135	513	0	378	135	513	0	100	19.84
SEPTEMBER		378	135	513	0	378	135	513	0	100	19.84
OCTOBER		378	137	515	0	378	137	515	0	100	19.92
NOVEMBER		378	139	517	0	378	139	517	0	100	20.00
DECEMBER		378	142	520	0	378	142	520	0	100	20.12
JANUARY	PR-MEAT	583	495	1078	0	74	495	569	509	13	14.82
FEBRUARY		583	490	1073	0	43	490	533	540	7	13.98
MARCH		583	496	1079	0	281	496	777	302	48	19.84
APRIL		583	493	1076	0	283	493	776	300	49	19.88
MAY		583	494	1077	0	280	494	774	303	48	12.97
JUNE		583	501	1084	0	271	501	772	312	46	18.94
JULY		583	515	1098	0	77	515	592	506	13	15.39
AUGUST		583	526	1109	0	78	526	604	505	13	15.71
SEPTEMBER		583	525	1108	0	79	525	604	504	13	15.70
OCTOBER		583	515	1098	0	84	515	599	499	14	15.55
NOVEMBER		583	506	1089	0	82	506	588	501	14	15.27
DECEMBER		583	490	1073	0	80	490	570	504	14	14.75

APPENDIX C - (Continued)

ANALYSIS OF LP MODEL OUTPUT FOR REGION 3

		FOOD INDUSTRIES OUTPUT (MILLION POUNDS)									
MONTH	FOOD ITEMS	AVAIL. PROD.	AVAIL. INVENT	AVAIL. TOTAL	REQD. IMPORT	REQD. PROD.	REQD. INVENT.	REQD. TOTAL	EXCESS	CAPACITY UTILIZ.	CONS. (LBS) /PER/MONTH
JANUARY	MILK	1102	0	1102	0	N.A	N.A	1102	0	N.A	.00
FEBRUARY		1048	0	1048	0	N.A	N.A	814	234	N.A	.00
MARCH		1131	0	1131	0	N.A	N.A	690	441	N.A	.00
APRIL		1271	0	1271	0	N.A	N.A	702	569	N.A	.00
MAY		1133	0	1133	0	N.A	N.A	675	458	N.A	.00
JUNE		1030	0	1030	0	N.A	N.A	653	377	N.A	.00
JULY		1101	0	1101	0	N.A	N.A	1101	0	N.A	.00
AUGUST		1068	0	1068	0	N.A	N.A	1068	0	N.A	.00
SEPTEMBER		1135	0	1135	0	N.A	N.A	1135	0	N.A	.00
OCTOBER		1167	0	1167	0	N.A	N.A	1167	0	N.A	.00
NOVEMBER		1000	0	1000	0	N.A	N.A	1000	0	N.A	.00
DECEMBER		1167	0	1167	0	N.A	N.A	1167	0	N.A	.00
JANUARY	FRUIT/VEG	0	492	492	0	N.A	N.A	491	1	N.A	17.87
FEBRUARY		0	433	433	0	N.A	N.A	433	0	N.A	15.75
MARCH		0	238	238	140	N.A	N.A	378	-140	N.A	13.75
APRIL		1	166	167	211	N.A	N.A	378	-211	N.A	13.76
MAY		72	64	136	242	N.A	N.A	378	-242	N.A	13.75
JUNE		275	84	359	19	N.A	N.A	378	-191	N.A	13.75
JULY		465	99	564	0	N.A	N.A	515	49	N.A	18.75
AUGUST		838	113	951	0	N.A	N.A	793	158	N.A	19.28
SEPTEMBER		906	295	1201	0	N.A	N.A	681	520	N.A	16.55
OCTOBER		670	466	1136	0	N.A	N.A	670	466	N.A	19.55
NOVEMBER		84	637	721	0	N.A	N.A	505	216	N.A	18.38
DECEMBER		6	807	813	0	N.A	N.A	518	295	N.A	18.85
JANUARY	GRAIN	0	14257	14257	0	N.A	N.A	337	13920	N.A	.00
FEBRUARY		0	12447	12447	0	N.A	N.A	284	12163	N.A	.00
MARCH		0	11046	11046	0	N.A	N.A	337	10709	N.A	.00
APRIL		0	9645	9645	0	N.A	N.A	337	9308	N.A	.00
MAY		0	8088	8088	0	N.A	N.A	337	7751	N.A	.00
JUNE		1178	6531	7709	0	N.A	N.A	337	7372	N.A	.00
JULY		1822	5832	7654	0	N.A	N.A	337	7317	N.A	.00
AUGUST		476	5133	5609	0	N.A	N.A	337	5272	N.A	.00
SEPTEMBER		2249	4434	6683	0	N.A	N.A	337	6346	N.A	.00
OCTOBER		10403	3735	14138	0	N.A	N.A	337	13801	N.A	.00
NOVEMBER		5640	7312	12952	0	N.A	N.A	337	12615	N.A	.00
DECEMBER		78	10785	10863	0	N.A	N.A	337	10526	N.A	.00

APPENDIX C - (continued)

ANALYSIS OF LP MODEL OUTPUT FOR REGION 3

		FOOD INDUSTRIES OUTPUT (MILLION POUNDS)									
MONTH	FOOD ITEMS	AVAIL. PROD.	AVAIL. INVENT	AVAIL. TOTAL	REQD. IMPORT	REQD. PROD.	REQD. INVENT.	REQD. TOTAL	EXCESS	CAPACITY UTILIZ.	CONS. (LBS). /PER/MONTH
JANUARY	MEAT	521	894	1415	0	N.A	N.A	521	894	N.A	.00
FEBRUARY		507	962	1469	0	N.A	N.A	507	962	N.A	.00
MARCH		585	1005	1590	0	N.A	N.A	306	1284	N.A	.00
APRIL		525	995	1520	0	N.A	N.A	291	1229	N.A	.00
MAY		544	977	1521	2	N.A	N.A	317	1204	N.A	.22
JUNE		584	961	1545	0	N.A	N.A	382	1163	N.A	.00
JULY		557	945	1502	0	N.A	N.A	557	945	N.A	.00
AUGUST		647	945	1592	0	N.A	N.A	647	945	N.A	.00
SEPTEMBER		600	945	1545	0	N.A	N.A	0	1545	N.A	.22
OCTOBER		618	946	1564	0	N.A	N.A	618	946	N.A	.00
NOVEMBER		586	863	1449	0	N.A	N.A	586	863	N.A	.00
DECEMBER		570	775	1345	0	N.A	N.A	570	775	N.A	.00
JANUARY	BAKED GOODS	154	23	177	0	0	23	23	154	0	.90
FEBRUARY		154	23	177	0	0	23	23	154	0	.90
MARCH		154	23	177	0	47	23	70	107	31	2.75
APRIL		154	23	177	0	47	23	70	107	31	2.75
MAY		154	23	177	0	51	23	74	103	33	2.88
JUNE		154	23	177	0	51	23	74	103	33	2.88
JULY		154	23	177	0	0	23	23	154	0	.90
AUGUST		154	23	177	0	0	23	23	154	0	.90
SEPTEMBER		154	23	177	0	0	23	23	154	0	.90
OCTOBER		154	23	177	0	0	23	23	154	0	.90
NOVEMBER		154	23	177	0	0	23	23	154	0	.90
DECEMBER		154	23	177	0	0	23	23	154	0	.90
JANUARY	DAIRY PROD.	2209	159	2368	0	580	159	739	1629	26	26.75
FEBRUARY		2209	159	2368	0	429	159	588	1780	19	20.76
MARCH		2209	165	2374	0	363	165	528	1846	16	18.26
APRIL		2209	169	2378	0	370	169	539	1839	17	18.06
MAY		2209	173	2382	0	355	173	528	1854	16	18.25
JUNE		2209	177	2386	0	344	177	521	1865	16	18.05
JULY		2209	175	2384	0	580	175	755	1630	26	27.38
AUGUST		2209	173	2382	0	562	173	735	1647	25	26.69
SEPTEMBER		2209	171	2380	0	597	171	768	1612	27	27.84
OCTOBER		2209	169	2378	0	614	169	783	1595	28	28.35
NOVEMBER		2209	168	2377	0	526	168	694	1683	24	25.24
DECEMBER		2209	167	2376	0	614	167	781	1595	28	28.27

ANALYSIS OF LP MODEL OUTPUT FOR REGION 3

		FOOD INDUSTRIES OUTPUT (MILLION POUNDS)									
MONTH	FOOD ITEMS	AVAIL. PROD.	AVAIL. INVENT	AVAIL. TOTAL	REQD. IMPORT	REQD. PROD.	REQD. INVENT.	REQD. TOTAL	EXCESS	CAPACITY UTILIZ.	CONS. (LBS) /PER/MONTH
JANUARY	PR-FRUIT/VEG	418	2364	2782	0	0	136	136	2646	0	5.58
FEBRUARY		418	2463	2881	0	0	120	120	2761	0	4.92
MARCH		418	2492	2910	0	0	105	105	2805	0	4.30
APRIL		418	2613	3031	0	0	105	105	2926	0	4.30
MAY		418	2618	3036	0	0	105	105	2931	0	4.30
JUNE		418	2517	2935	0	0	105	105	2830	0	4.30
JULY		418	2618	3036	0	12	143	154	2882	1	5.66
AUGUST		418	2625	3043	0	147	0	147	2896	35	6.03
SEPTEMBER		418	2339	2757	0	126	0	126	2631	30	5.17
OCTOBER		418	2712	3130	0	74	75	149	2981	18	6.11
NOVEMBER		418	2666	3084	0	0	140	140	2944	0	5.74
DECEMBER		418	2350	2768	0	0	143	143	2625	0	5.85
JANUARY	PR-GRAIN	259	109	368	0	259	109	368	0	100	14.83
FEBRUARY		259	109	368	0	218	109	327	41	84	13.14
MARCH		259	109	368	0	259	109	368	0	100	14.83
APRIL		259	109	368	0	259	109	368	0	100	14.83
MAY		259	110	369	0	259	110	369	0	100	14.87
JUNE		259	110	369	0	259	110	369	0	100	14.87
JULY		259	110	369	0	259	110	369	0	100	14.87
AUGUST		259	110	369	0	259	110	369	0	100	14.87
SEPTEMBER		259	110	369	0	259	110	369	0	100	14.87
OCTOBER		259	110	369	0	259	110	369	0	100	14.87
NOVEMBER		259	111	370	0	259	111	370	0	100	14.91
DECEMBER		259	112	371	0	259	112	371	0	100	14.95
JANUARY	PR-MEAT	2452	634	3086	0	445	634	1079	2007	18	27.87
FEBRUARY		2452	621	3073	0	433	621	1054	2019	18	27.24
MARCH		2452	606	3058	0	238	606	844	2214	10	21.38
APRIL		2452	636	3088	0	200	636	836	2252	8	21.28
MAY		2452	644	3096	0	194	644	838	2258	8	21.38
JUNE		2452	671	3123	0	173	671	844	2279	7	21.27
JULY		2452	709	3161	0	476	709	1185	1976	19	30.66
AUGUST		2452	745	3197	0	553	745	1298	1899	23	33.44
SEPTEMBER		2452	780	3232	0	0	760	780	2452	0	21.57
OCTOBER		2452	744	3196	0	528	744	1272	1924	22	32.84
NOVEMBER		2452	712	3164	0	501	712	1213	1951	20	31.38
DECEMBER		2452	679	3131	0	487	679	1166	1965	20	30.89

ANALYSIS OF LP MODEL OUTPUT FOR REGION-4

		FOOD INDUSTRIES OUTPUT (MILLION POUNDS)									
MONTH	FOOD ITEMS	AVAIL. PROD.	AVAIL. INVENT	AVAIL. TOTAL	REQD. IMPORT	REQD. PROD.	REQD. INVENT.	REQD. TOTAL	EXCESS	CAPACITY UTILIZ.	CONS. (LBS) /PER/MONTH
JANUARY	MILK	986	0	986	0	N.A	N.A	986	0	N.A	.00
FEBRUARY		939	0	939	0	N.A	N.A	939	0	N.A	.00
MARCH		1060	0	1060	0	N.A	N.A	1060	0	N.A	.00
APRIL		1143	0	1143	0	N.A	N.A	1143	0	N.A	.00
MAY		1019	0	1019	0	N.A	N.A	1019	0	N.A	.00
JUNE		927	0	927	0	N.A	N.A	927	0	N.A	.00
JULY		946	0	946	0	N.A	N.A	946	0	N.A	.00
AUGUST		917	0	917	0	N.A	N.A	917	0	N.A	.00
SEPTEMBER		974	0	974	0	N.A	N.A	974	0	N.A	.00
OCTOBER		1029	0	1029	0	N.A	N.A	1029	0	N.A	.00
NOVEMBER		882	0	882	0	N.A	N.A	882	0	N.A	.00
DECEMBER		1029	0	1029	0	N.A	N.A	1029	0	N.A	.00
JANUARY	FRUIT/VEG	361	74	435	197	N.A	N.A	632	-197	N.A	13.83
FEBRUARY		360	42	402	230	N.A	N.A	632	-230	N.A	13.82
MARCH		360	16	376	255	N.A	N.A	631	-255	N.A	13.81
APRIL		669	11	680	0	N.A	N.A	669	11	N.A	13.81
MAY		855	6	861	0	N.A	N.A	855	6	N.A	13.81
JUNE		732	1	733	0	N.A	N.A	732	1	N.A	13.81
JULY		607	24	631	1	N.A	N.A	632	-1	N.A	13.82
AUGUST		489	45	534	98	N.A	N.A	632	-98	N.A	13.83
SEPTEMBER		407	67	474	158	N.A	N.A	632	-158	N.A	13.82
OCTOBER		456	80	536	95	N.A	N.A	631	-95	N.A	13.81
NOVEMBER		418	92	510	121	N.A	N.A	631	-121	N.A	13.8
DECEMBER		346	105	451	180	N.A	N.A	631	-180	N.A	13.80
JANUARY	GRAIN	0	35367	35367	0	N.A	N.A	472	34895	N.A	.00
FEBRUARY		0	29323	29323	0	N.A	N.A	472	28851	N.A	.00
MARCH		0	24179	24179	0	N.A	N.A	472	23707	N.A	.00
APRIL		0	19035	19035	0	N.A	N.A	472	18563	N.A	.00
MAY		1340	14903	16243	0	N.A	N.A	472	15771	N.A	.00
JUNE		10911	10771	21682	0	N.A	N.A	472	21210	N.A	.00
JULY		1704	9895	11599	0	N.A	N.A	472	11127	N.A	.00
AUGUST		1173	9020	10193	0	N.A	N.A	472	9721	N.A	.00
SEPTEMBER		8567	8408	16975	0	N.A	N.A	472	16503	N.A	.00
OCTOBER		28938	7797	36735	0	N.A	N.A	472	36263	N.A	.00
NOVEMBER		17675	17167	34842	0	N.A	N.A	472	34370	N.A	.00
DECEMBER		2828	26267	29095	0	N.A	N.A	472	28623	N.A	.00

APPENDIX C - (Continued)

ANALYSIS OF LP MODEL OUTPUT FOR REGION-4

		FOOD INDUSTRIES OUTPUT (MILLION POUNDS)									
MONTH	FOOD ITEMS	AVAIL. PROD.	AVAIL. INVENT	AVAIL. TOTAL	REQD. IMPORT	REQD. PROD.	REQD. INVENT.	REQD. TOTAL	EXCESS	CAPACITY UTILIZ.	CONS. (LBS) /PER/MONTH
JANUARY	MEAT	1107	1685	2792	0	N.A	N.A	538	2254	N.A	.00
FEBRUARY		1165	1756	2921	0	N.A	N.A	551	2370	N.A	.00
MARCH		1330	1813	3143	0	N.A	N.A	557	2586	N.A	.00
APRIL		1275	1808	3083	0	N.A	N.A	532	2551	N.A	.00
MAY		1305	1781	3086	0	N.A	N.A	531	2555	N.A	.00
JUNE		1461	1761	3222	0	N.A	N.A	510	2712	N.A	.00
JULY		1347	1722	3069	0	N.A	N.A	481	2588	N.A	.00
AUGUST		1227	1724	2951	0	N.A	N.A	454	2497	N.A	.00
SEPTEMBER		1335	1722	3057	0	N.A	N.A	428	2629	N.A	.00
OCTOBER		1330	1732	3062	0	N.A	N.A	451	2611	N.A	.00
NOVEMBER		1227	1631	2858	0	N.A	N.A	468	2390	N.A	.00
DECEMBER		1291	1583	2874	0	N.A	N.A	487	2387	N.A	.00
JANUARY	BAKED GOODS	323	39	362	0	24	39	63	299	7	1.48
FEBRUARY		323	39	362	0	30	39	69	293	9	1.62
MARCH		323	39	362	0	36	39	75	287	11	1.77
APRIL		323	39	362	0	36	39	75	287	11	1.77
MAY		323	39	362	0	39	39	78	284	12	1.84
JUNE		323	39	362	0	36	39	75	287	11	1.77
JULY		323	39	362	0	30	39	69	293	9	1.62
AUGUST		323	39	362	0	27	39	66	296	8	1.55
SEPTEMBER		323	39	362	0	30	39	69	293	9	1.62
OCTOBER		323	39	362	0	36	39	75	287	11	1.77
NOVEMBER		323	39	362	0	43	39	82	281	13	1.92
DECEMBER		323	39	362	0	46	39	85	277	14	1.99
JANUARY	DAIRY PROD.	5206	186	5392	111	519	186	816	4577	10	18.15
FEBRUARY		5206	181	5387	137	494	181	812	4575	9	18.14
MARCH		5206	177	5383	86	558	177	820	4563	11	18.13
APRIL		5206	181	5387	44	602	181	827	4561	12	18.13
MAY		5206	184	5390	97	536	184	817	4573	10	18.12
JUNE		5206	188	5394	135	488	188	811	4584	9	18.13
JULY		5206	189	5395	125	498	189	812	4583	10	18.14
AUGUST		5206	190	5396	138	483	190	810	4586	9	18.14
SEPTEMBER		5206	191	5397	111	513	191	814	4583	10	18.14
OCTOBER		5206	194	5400	83	542	194	818	4582	10	18.13
NOVEMBER		5206	197	5403	146	464	197	807	4596	9	18.12
DECEMBER		5206	200	5406	76	542	200	818	4588	10	18.11

APPENDIX C - (Continued)

ANALYSIS OF LP MODEL OUTPUT FOR REGION 4

		FOOD INDUSTRIES OUTPUT (MILLION POUNDS)									
MONTH	FOOD ITEMS	AVAIL. PROD.	AVAIL. INVENT	AVAIL. TOTAL	REQD. IMPORT	REQD. PROD.	REQD. INVENT.	REQD. TOTAL	EXCESS	CAPACITY UTILIZ.	CONS. (LBS) /PER/MONTH
JANUARY	PR-FRUIT/VEG	1176	3831	5007	0	0	175	175	4832	0	4.32
FEBRUARY		1176	3961	5137	0	0	175	175	4962	0	4.32
MARCH		1176	4010	5186	0	0	175	175	5011	0	4.32
APRIL		1176	4281	5457	0	20	154	174	5283	2	4.32
MAY		1176	4277	5453	0	125	50	175	5278	11	4.31
JUNE		1176	4019	5195	0	56	119	175	5020	5	4.32
JULY		1176	4241	5417	0	0	175	175	5242	0	4.32
AUGUST		1176	4227	5403	0	0	175	175	5228	0	4.32
SEPTEMBER		1176	3642	4818	0	0	175	175	4643	0	4.32
OCTOBER		1176	4406	5582	0	0	175	175	5407	0	4.32
NOVEMBER		1176	4374	5550	0	0	175	175	5375	0	4.31
DECEMBER		1176	3798	4974	0	0	175	175	4799	0	4.31
JANUARY	PR-GRAIN	363	228	591	0	363	228	591	0	100	13.61
FEBRUARY		363	230	593	0	363	230	593	0	100	13.45
MARCH		363	232	595	0	363	232	595	0	100	13.30
APRIL		363	232	595	0	363	232	595	0	100	13.30
MAY		363	233	596	0	363	233	596	0	100	13.22
JUNE		363	232	595	0	363	232	595	0	100	13.30
JULY		363	230	593	0	363	230	593	0	100	13.45
AUGUST		363	229	592	0	363	229	592	0	100	13.53
SEPTEMBER		363	230	593	0	363	230	593	0	100	13.45
OCTOBER		363	232	595	0	363	232	595	0	100	13.30
NOVEMBER		363	234	597	0	363	234	597	0	100	13.15
DECEMBER		363	235	598	0	363	235	598	0	100	13.07
JANUARY	PR-MEAT	1962	891	2853	0	460	891	1351	1502	23	21.22
FEBRUARY		1962	881	2843	0	471	881	1352	1491	24	21.23
MARCH		1962	876	2838	0	476	876	1352	1486	24	21.19
APRIL		1962	894	2856	0	455	894	1349	1507	23	21.19
MAY		1962	894	2856	0	454	894	1348	1508	23	21.18
JUNE		1962	910	2872	0	436	910	1346	1527	22	21.19
JULY		1962	931	2893	0	411	931	1342	1551	21	21.20
AUGUST		1962	951	2913	0	388	951	1339	1574	20	21.21
SEPTEMBER		1962	969	2931	0	366	969	1335	1596	19	21.20
OCTOBER		1962	952	2914	0	386	952	1338	1577	20	21.19
NOVEMBER		1962	939	2901	0	400	939	1339	1562	20	21.17
DECEMBER		1962	925	2887	0	416	925	1341	1546	21	21.16

APPENDIX C - (Continued)

ANALYSIS OF LP MODEL OUTPUT FOR REGION 5

		FOOD INDUSTRIES OUTPUT (MILLION POUNDS)									
MONTH	FOOD ITEMS	AVAIL. PROD.	AVAIL. INVENT	AVAIL. TOTAL	REQD. IMPORT	REQD. PROD.	REQD. INVENT.	REQD. TOTAL	EXCESS	CAPACITY UTILIZ.	CONS. (LBS/ /PER/MONT-
JANUARY	MILK	3907	0	3907	0	N.A	N.A	3362	545	N.A	.22
FEBRUARY		3652	0	3652	0	N.A	N.A	3141	511	N.A	.20
MARCH		4139	0	4139	0	N.A	N.A	3611	528	N.A	.22
APRIL		4743	0	4743	0	N.A	N.A	4210	533	N.A	.20
MAY		4230	0	4230	0	N.A	N.A	3849	381	N.A	.22
JUNE		3845	0	3845	0	N.A	N.A	3591	254	N.A	.20
JULY		3953	0	3953	0	N.A	N.A	3672	281	N.A	.20
AUGUST		3833	0	3833	3	N.A	N.A	3558	276	N.A	.20
SEPTEMBER		4072	0	4072	0	N.A	N.A	3751	321	N.A	.20
OCTOBER		3982	0	3982	0	N.A	N.A	3686	296	N.A	.20
NOVEMBER		3413	0	3413	0	N.A	N.A	3206	207	N.A	.20
DECEMBER		3982	0	3982	0	N.A	N.A	3705	277	N.A	.22
JANUARY	FRUIT/VEG	0	1981	1981	0	N.A	N.A	686	1295	N.A	13.15
FEBRUARY		0	1869	1869	0	N.A	N.A	686	1183	N.A	13.15
MARCH		0	1355	1355	0	N.A	N.A	238	1117	N.A	13.15
APRIL		0	906	906	0	N.A	N.A	686	220	N.A	13.15
MAY		5	475	480	204	N.A	N.A	684	-204	N.A	13.15
JUNE		290	577	857	0	N.A	N.A	686	171	N.A	13.16
JULY		1104	305	1409	0	N.A	N.A	1026	383	N.A	13.15
AUGUST		2099	33	2132	0	N.A	N.A	1759	373	N.A	13.16
SEPTEMBER		3875	730	4605	0	N.A	N.A	3535	1070	N.A	13.16
OCTOBER		2836	1520	4356	0	N.A	N.A	2496	1860	N.A	13.16
NOVEMBER		799	2307	3106	0	N.A	N.A	799	2307	N.A	13.16
DECEMBER		12	3094	3106	0	N.A	N.A	686	2420	N.A	13.15
JANUARY	GRAIN	0	253271	253271	0	N.A	N.A	1069	252202	N.A	.22
FEBRUARY		0	224701	224701	0	N.A	N.A	1080	223621	N.A	.22
MARCH		0	202380	202380	0	N.A	N.A	1060	201320	N.A	.22
APRIL		0	180059	180059	0	N.A	N.A	1089	178970	N.A	.20
MAY		0	154287	154287	0	N.A	N.A	1382	152905	N.A	.20
JUNE		0	128514	128514	0	N.A	N.A	1146	127368	N.A	.22
JULY		14850	118468	133318	0	N.A	N.A	1155	132163	N.A	.20
AUGUST		13330	108421	121751	0	N.A	N.A	1167	120584	N.A	.20
SEPTEMBER		12726	98375	111101	0	N.A	N.A	1177	109924	N.A	.20
OCTOBER		134007	88328	222335	0	N.A	N.A	1166	221169	N.A	.20
NOVEMBER		98265	144409	242674	0	N.A	N.A	1152	241522	N.A	.20
DECEMBER		6870	198840	205710	0	N.A	N.A	1086	204624	N.A	.20

APPENDIX C - (Continued)

ANALYSIS OF LP MODEL OUTPUT FOR REGION 5

		FOOD INDUSTRIES OUTPUT (MILLION POUNDS)								
MONTH	FOOD ITEMS	AVAIL. PROD.	AVAIL. INVENT	AVAIL. TOTAL	REQD. IMPORT	REQD. PROD.	REQD. INVENT.	REQD. TOTAL	EXCESS	CAPACITY UTILIZ.	CONS. (LBS) /PER/MONTH
JANUARY	MEAT	1072	2958	4030	0	N.A	N.A	0	4030	N.A	.00
FEBRUARY		1234	3060	4094	0	N.A	N.A	0	4094	N.A	.00
MARCH		1146	3116	4262	0	N.A	N.A	0	4262	N.A	.00
APRIL		1045	3126	4171	0	N.A	N.A	0	4171	N.A	.00
MAY		1075	3101	4176	0	N.A	N.A	0	4176	N.A	.00
JUNE		1172	3094	4266	0	N.A	N.A	0	4266	N.A	.00
JULY		1094	3070	4164	0	N.A	N.A	0	4164	N.A	.00
AUGUST		1135	3013	4148	0	N.A	N.A	0	4148	N.A	.00
SEPTEMBER		1106	2981	4087	0	N.A	N.A	0	4087	N.A	.00
OCTOBER		1223	2939	4162	0	N.A	N.A	0	4162	N.A	.00
NOVEMBER		1166	2873	4039	0	N.A	N.A	0	4039	N.A	.00
DECEMBER		1077	2709	3786	0	N.A	N.A	0	3786	N.A	.00
JANUARY	BAKED GOODS	598	44	642	0	598	44	642	0	100	13.25
FEBRUARY		598	44	642	0	598	44	642	0	100	13.25
MARCH		598	44	642	0	598	44	642	0	100	13.25
APRIL		598	44	642	0	598	44	642	0	100	13.25
MAY		598	44	642	0	598	44	642	0	100	13.25
JUNE		598	44	642	0	598	44	642	0	100	13.25
JULY		598	44	642	0	598	44	642	0	100	13.25
AUGUST		598	44	642	0	598	44	642	0	100	13.25
SEPTEMBER		598	44	642	0	598	44	642	0	100	13.25
OCTOBER		598	44	642	0	598	44	642	0	100	13.25
NOVEMBER		598	44	642	0	598	44	642	0	100	13.25
DECEMBER		598	44	642	0	598	44	642	0	100	13.25
JANUARY	DAIRY PROD.	10925	818	11743	0	287	818	1105	10638	3	17.27
FEBRUARY		10925	817	11742	0	269	817	1086	10656	2	17.26
MARCH		10925	844	11769	0	278	844	1122	10647	3	17.26
APRIL		10925	886	11811	0	281	886	1167	10644	3	17.27
MAY		10925	926	11851	0	201	926	1127	10724	2	17.28
JUNE		10925	967	11892	0	134	967	1101	10791	1	17.27
JULY		10925	961	11886	0	148	961	1109	10777	1	17.27
AUGUST		10925	955	11880	0	145	955	1100	10780	1	17.27
SEPTEMBER		10925	949	11874	0	169	949	1118	10756	2	17.28
OCTOBER		10925	955	11880	0	156	955	1111	10769	1	17.27
NOVEMBER		10925	960	11885	0	109	960	1069	10816	1	17.27
DECEMBER		10925	965	11890	0	146	965	1111	10779	1	17.27

APPENDIX C - (Continued)

ANALYSIS OF LP MODEL OUTPUT FOR REGION 5

		FOOD INDUSTRIES OUTPUT (MILLION POUNDS)								
MONTH	FOOD ITEMS	AVAIL. PROD.	AVAIL. INVENT	AVAIL. TOTAL	REQD. IMPORT	REQD. PROD.	REQD. INVENT.	REQD. TOTAL	EXCESS	CAPACITY UTILIZ.	CONS. (LBS) /PER/MONTH
JANUARY	PR-FRUIT/VEG	3673	3974	7647	0	0	190	190	7457	0	4.11
FEBRUARY		3673	3902	7575	0	0	190	190	7385	0	4.11
MARCH		3673	3836	7509	0	0	190	190	7319	0	4.11
APRIL		3673	3826	7499	0	0	190	190	7309	2	4.11
MAY		3673	3781	7454	0	0	189	189	7265	2	4.12
JUNE		3673	3657	7330	0	0	190	190	7140	2	4.11
JULY		3673	3872	7545	0	190	0	190	7355	5	4.11
AUGUST		3673	4031	7704	0	190	0	190	7514	5	4.11
SEPTEMBER		3673	4179	7852	0	190	0	190	7662	5	4.11
OCTOBER		3673	4469	8142	0	190	0	190	7952	5	4.11
NOVEMBER		3673	4317	7990	0	63	127	190	7800	3	4.11
DECEMBER		3673	4146	7819	0	0	190	190	7629	2	4.11
JANUARY	PR-GRAIN	1615	270	1885	0	777	270	1047	838	48	4.43
FEBRUARY		1615	269	1884	0	785	269	1054	830	49	4.63
MARCH		1615	268	1883	0	799	268	1067	816	49	4.93
APRIL		1615	272	1887	0	777	272	1049	838	48	4.53
MAY		1615	275	1890	0	1063	275	1338	552	66	10.66
JUNE		1615	278	1893	0	734	278	1012	881	45	3.71
JULY		1615	276	1891	0	726	276	1002	889	45	3.51
AUGUST		1615	275	1890	0	718	275	993	898	44	3.29
SEPTEMBER		1615	273	1888	0	710	273	983	905	44	3.08
OCTOBER		1615	279	1894	0	718	279	997	897	44	3.33
NOVEMBER		1615	285	1900	0	729	285	1014	886	45	3.75
DECEMBER		1615	292	1907	0	835	292	1127	780	52	4.26
JANUARY	PR-MEAT	1414	1176	2590	0	0	1176	1176	1414	0	16.82
FEBRUARY		1414	1166	2580	0	0	1166	1166	1414	0	16.65
MARCH		1414	1145	2559	0	0	1145	1145	1414	0	16.35
APRIL		1414	1173	2587	0	0	1173	1173	1414	0	16.76
MAY		1414	1201	2615	0	0	733	733	1883	0	10.33
JUNE		1414	1230	2644	0	0	1230	1230	1414	0	17.59
JULY		1414	1244	2658	0	0	1244	1244	1414	0	17.79
AUGUST		1414	1259	2673	0	0	1259	1259	1414	0	18.01
SEPTEMBER		1414	1274	2688	0	0	1274	1274	1414	0	18.23
OCTOBER		1414	1252	2666	0	0	1252	1252	1414	0	17.91
NOVEMBER		1414	1227	2641	0	0	1227	1227	1414	0	17.54
DECEMBER		1414	1206	2620	0	0	1206	1206	1414	0	17.24

APPENDIX C - (Continued)

ANALYSIS OF LP MODEL OUTPUT FOR REGION 6

FOOD INDUSTRIES OUTPUT (MILLION POUNDS)

MONTH	FOOD ITEMS	AVAIL. PROD.	AVAIL. INVENT	AVAIL. TOTAL	REQD. IMPORT	REQD. PROD.	REQD. INVENT.	REQD. TOTAL	EXCESS	CAPACITY UTILIZ.	CONS. LBS /PER/MONTH
JANUARY	MILK	630	0	630	0	N.A	N.A	630	0	N.A	.00
FEBRUARY		594	0	594	0	N.A	N.A	594	0	N.A	.00
MARCH		675	0	675	0	N.A	N.A	675	0	N.A	.00
APRIL		651	0	651	0	N.A	N.A	651	0	N.A	.00
MAY		581	0	581	0	N.A	N.A	581	0	N.A	.00
JUNE		528	0	528	0	N.A	N.A	528	0	N.A	.00
JULY		529	0	529	0	N.A	N.A	529	0	N.A	.00
AUGUST		513	0	513	0	N.A	N.A	513	0	N.A	.00
SEPTEMBER		545	0	545	0	N.A	N.A	545	0	N.A	.00
OCTOBER		571	0	571	0	N.A	N.A	571	0	N.A	.00
NOVEMBER		490	0	490	0	N.A	N.A	490	0	N.A	.00
DECEMBER		571	0	571	0	N.A	N.A	571	0	N.A	.00
JANUARY	FRUIT/VEG	99	3	102	309	N.A	N.A	411	-309	N.A	13.63
FEBRUARY		96	2	98	313	N.A	N.A	411	-313	N.A	13.63
MARCH		131	1	132	279	N.A	N.A	411	-279	N.A	13.63
APRIL		268	0	268	143	N.A	N.A	411	-143	N.A	13.63
MAY		402	0	402	9	N.A	N.A	411	-9	N.A	13.63
JUNE		392	0	392	19	N.A	N.A	411	-19	N.A	13.63
JULY		276	0	276	135	N.A	N.A	411	-135	N.A	13.63
AUGUST		263	1	264	147	N.A	N.A	411	-147	N.A	13.63
SEPTEMBER		122	1	123	288	N.A	N.A	411	-288	N.A	13.63
OCTOBER		219	2	221	190	N.A	N.A	411	-190	N.A	13.63
NOVEMBER		236	4	240	171	N.A	N.A	411	-171	N.A	13.63
DECEMBER		168	6	174	237	N.A	N.A	411	-237	N.A	13.63
JANUARY	GRAIN	0	56706	56706	0	N.A	N.A	445	56261	N.A	.00
FEBRUARY		0	48413	48413	0	N.A	N.A	520	47893	N.A	.00
MARCH		0	41521	41521	0	N.A	N.A	555	40966	N.A	.00
APRIL		0	34630	34630	0	N.A	N.A	544	34086	N.A	.00
MAY		1469	30749	32218	0	N.A	N.A	545	31673	N.A	.00
JUNE		25528	26869	52397	0	N.A	N.A	499	51898	N.A	.00
JULY		3266	29109	32375	0	N.A	N.A	447	31928	N.A	.00
AUGUST		5845	31350	37195	0	N.A	N.A	388	36807	N.A	.00
SEPTEMBER		19056	35989	55045	0	N.A	N.A	436	54609	N.A	.00
OCTOBER		18433	40628	59061	0	N.A	N.A	464	58597	N.A	.00
NOVEMBER		7920	46065	53985	0	N.A	N.A	479	53506	N.A	.00
DECEMBER		655	51386	52041	0	N.A	N.A	486	51555	N.A	.00

APPENDIX C - (Continued)

ANALYSIS OF LP MODEL OUTPUT FOR REGION 6

		FOOD INDUSTRIES OUTPUT (MILLION POUNDS)									
MONTH	FOOD ITEMS	AVAIL. PROD.	AVAIL. INVENT	AVAIL. TOTAL	REQD. IMPORT	REQD. PROD.	REQD. INVENT.	REQD. TOTAL	EXCESS	CAPACITY UTILIZ.	CONS. LBS/ /PER/MONT
JANUARY	MEAT	969	2576	3545	0	N.A	N.A	0	3545.	N.A	.22
FEBRUARY		957	2564	3521	0	N.A	N.A	0	3521.	N.A	.22
MARCH		1061	2536	3597	0	N.A	N.A	0	3597	N.A	.22
APRIL		1065	2535	3600	0	N.A	N.A	0	3600.	N.A	.22
MAY		1215	2551	3766	0	N.A	N.A	0	3766.	N.A	.22
JUNE		1515	2476	3991	0	N.A	N.A	0	3991.	N.A	.22
JULY		1344	2473	3817	0	N.A	N.A	0	3817	N.A	.22
AUGUST		1322	2467	3789	0	N.A	N.A	0	3789	N.A	.22
SEPTEMBER		1198	2481	3679	0	N.A	N.A	0	3679.	N.A	.22
OCTOBER		1075	2467	3542	0	N.A	N.A	0	3542	N.A	.22
NOVEMBER		992	2462	3454	0	N.A	N.A	0	3454.	N.A	.22
DECEMBER		991	2187	3178	0	N.A	N.A	0	3178.	N.A	.22
JANUARY	BAKED GOODS	94	25	119	0	94	25	119	0	100	4.24
FEBRUARY		94	25	119	0	94	25	119	0	100	4.24
MARCH		94	25	119	0	94	25	119	0	100	4.24
APRIL		94	25	119	0	94	25	119	0	100	4.24
MAY		94	25	119	0	94	25	119	0	100	4.24
JUNE		94	25	119	0	94	25	119	0	100	4.24
JULY		94	25	119	0	94	25	119	0	100	4.24
AUGUST		94	25	119	0	94	25	119	0	100	4.24
SEPTEMBER		94	25	119	0	94	25	119	0	100	4.24
OCTOBER		94	25	119	0	94	25	119	0	100	4.24
NOVEMBER		94	25	119	0	94	25	119	0	100	4.24
DECEMBER		94	25	119	0	94	25	119	0	100	4.24
JANUARY	DAIRY PROD.	1722	154	1876	46	332	154	531	1345	19	17.89
FEBRUARY		1722	156	1878	60	313	156	529	1349	18	17.89
MARCH		1722	155	1877	25	355	155	535	1342	21	17.89
APRIL		1722	153	1875	37	343	153	533	1342	20	17.89
MAY		1722	150	1872	72	306	150	528	1344	18	17.89
JUNE		1722	148	1870	98	278	148	524	1346	16	17.89
JULY		1722	143	1865	103	278	143	524	1341	16	17.89
AUGUST		1722	139	1861	114	270	139	523	1338	16	17.89
SEPTEMBER		1722	134	1856	104	287	134	525	1331	17	17.89
OCTOBER		1722	134	1856	93	301	134	527	1329	17	17.89
NOVEMBER		1722	134	1856	129	258	134	521	1335	15	17.89
DECEMBER		1722	134	1856	93	301	134	527	1329	17	17.89

APPENDIX C - (Continued)

ANALYSIS OF LP MODEL OUTPUT FOR REGION 6

		FOOD INDUSTRIES OUTPUT (MILLION POUNDS)									
MONTH	FOOD ITEMS	AVAIL. PROD.	AVAIL. INVENT	AVAIL. TOTAL	REQD. IMPORT	REQD. PROD.	REQD. INVENT.	REQD. TOTAL	EXCESS	CAPACITY UTILIZ.	CONS. (LBS) /PER/MONTH
JANUARY	PR-FRUIT/VEG	317	2100	2417	0	0	114	114	2303	0	4.26
FEBRUARY		317	2092	2409	0	0	114	114	2295	0	4.26
MARCH		317	2079	2396	0	0	114	114	2282	0	4.26
APRIL		317	2211	2528	0	0	114	114	2414	0	4.26
MAY		317	2198	2515	0	0	114	114	2401	0	4.26
JUNE		317	2053	2370	0	0	114	114	2256	0	4.26
JULY		317	2261	2578	0	0	114	114	2464	0	4.26
AUGUST		317	2343	2660	0	0	114	114	2546	0	4.26
SEPTEMBER		317	2085	2402	0	0	114	114	2288	0	4.26
OCTOBER		317	2488	2805	0	0	114	114	2691	0	4.26
NOVEMBER		317	2451	2768	0	0	114	114	2654	0	4.26
DECEMBER		317	2092	2409	0	0	114	114	2295	0	4.26
JANUARY	PR-GRAIN	593	446	1039	0	251	446	697	342	42	20.81
FEBRUARY		593	504	1097	0	193	504	697	400	33	20.81
MARCH		593	531	1124	0	166	531	697	427	25	20.81
APRIL		593	522	1115	0	175	522	697	418	29	20.81
MAY		593	523	1116	0	174	523	697	419	29	20.81
JUNE		593	488	1081	0	209	488	697	384	35	20.81
JULY		593	448	1041	0	249	448	697	344	42	20.81
AUGUST		593	398	991	0	299	398	697	294	50	20.81
SEPTEMBER		593	439	1032	0	258	439	697	335	43	20.81
OCTOBER		593	461	1054	0	236	461	697	357	40	20.81
NOVEMBER		593	472	1065	0	225	472	697	368	38	20.81
DECEMBER		593	478	1071	0	219	478	697	374	37	20.81
JANUARY	PR-MEAT	1157	673	1830	0	0	430	430	1400	0	10.74
FEBRUARY		1157	663	1820	0	0	430	430	1390	0	10.74
MARCH		1157	679	1836	0	0	430	430	1406	0	10.74
APRIL		1157	681	1838	0	0	430	430	1408	0	10.74
MAY		1157	679	1836	0	0	430	430	1406	0	10.74
JUNE		1157	685	1842	0	0	430	430	1412	0	10.74
JULY		1157	692	1849	0	0	430	430	1419	0	10.74
AUGUST		1157	699	1856	0	0	430	430	1426	0	10.74
SEPTEMBER		1157	705	1862	0	0	430	430	1432	0	10.74
OCTOBER		1157	691	1848	0	0	430	430	1418	0	10.74
NOVEMBER		1157	684	1841	0	0	430	430	1411	0	10.74
DECEMBER		1157	677	1834	0	0	430	430	1404	0	10.74

ANALYSIS OF LP MODEL OUTPUT FOR REGION 7

		FOOD INDUSTRIES OUTPUT (MILLION POUNDS)									
MONTH	FOOD ITEMS	AVAIL. PROD.	AVAIL. INVENT	AVAIL. TOTAL	REQD. IMPORT	REQD. PROD.	REQD. INVENT.	REQD. TOTAL	EXCESS	CAPACITY UTILIZ.	CONS. (LBS) /PER/MONTH
JANUARY	MILK	711	0	711	0	N.A	N.A	575	136	N.A	.23
FEBRUARY		651	0	651	0	N.A	N.A	526	125	N.A	.23
MARCH		721	0	721	0	N.A	N.A	483	238	N.A	.33
APRIL		820	0	820	0	N.A	N.A	694	126	N.A	.20
MAY		731	0	731	0	N.A	N.A	646	85	N.A	.23
JUNE		665	0	665	0	N.A	N.A	623	42	N.A	.20
JULY		710	0	710	0	N.A	N.A	666	44	N.A	.22
AUGUST		688	0	688	0	N.A	N.A	651	37	N.A	.23
SEPTEMBER		730	0	730	0	N.A	N.A	693	37	N.A	.23
OCTOBER		730	0	730	0	N.A	N.A	706	24	N.A	.23
NOVEMBER		626	0	626	0	N.A	N.A	622	4	N.A	.23
DECEMBER		730	0	730	0	N.A	N.A	725	5	N.A	.23
JANUARY	FRUIT/VEG	0	180	180	0	N.A	N.A	170	10	N.A	12.57
FEBRUARY		0	157	157	13	N.A	N.A	170	-13	N.A	12.57
MARCH		0	135	135	35	N.A	N.A	170	-35	N.A	12.57
APRIL		0	73	73	97	N.A	N.A	170	-97	N.A	12.57
MAY		0	23	23	147	N.A	N.A	170	-147	N.A	12.57
JUNE		5	48	53	117	N.A	N.A	170	-117	N.A	12.57
JULY		30	25	55	115	N.A	N.A	170	-115	N.A	12.57
AUGUST		82	1	83	87	N.A	N.A	170	-87	N.A	12.57
SEPTEMBER		156	49	205	0	N.A	N.A	170	35	N.A	12.57
OCTOBER		514	97	611	0	N.A	N.A	207	404	N.A	12.57
NOVEMBER		22	144	166	4	N.A	N.A	170	-4	N.A	12.57
DECEMBER		0	191	191	0	N.A	N.A	170	21	N.A	12.57
JANUARY	GRAIN	0	230984	230984	0	N.A	N.A	367	230617	N.A	.00
FEBRUARY		0	209138	209138	0	N.A	N.A	367	208771	N.A	.00
MARCH		0	191439	191439	0	N.A	N.A	369	191070	N.A	.00
APRIL		0	173739	173739	0	N.A	N.A	366	173373	N.A	.00
MAY		0	154722	154722	0	N.A	N.A	363	154359	N.A	.00
JUNE		24815	135704	160519	0	N.A	N.A	959	159560	N.A	.00
JULY		16601	132559	149160	0	N.A	N.A	956	148204	N.A	.00
AUGUST		269	129414	129683	0	N.A	N.A	952	128731	N.A	.00
SEPTEMBER		26772	126314	153086	0	N.A	N.A	954	152132	N.A	.00
OCTOBER		108765	123215	231980	0	N.A	N.A	960	231020	N.A	.00
NOVEMBER		66488	159856	226344	0	N.A	N.A	352	225992	N.A	.00
DECEMBER		10472	195420	205892	0	N.A	N.A	345	205547	N.A	.00

APPENDIX C - (Continued)

ANALYSIS OF LP MODEL OUTPUT FOR REGION 7

		FOOD INDUSTRIES OUTPUT (MILLION POUNDS)									
MONTH	FOOD ITEMS	AVAIL. PROD.	AVAIL. INVENT	AVAIL. TOTAL	REQD. IMPORT	REQD. PROD.	REQD. INVENT.	REQD. TOTAL	EXCESS	CAPACITY UTILIZ.	CONS.(LBS) /PER/MONTH
JANUARY	MEAT	1971	5140	7111	0	N.A	N.A	0	7111	N.A	.22
FEBRUARY		1817	5149	6966	0	N.A	N.A	0	6966	N.A	.20
MARCH		1935	5179	7114	0	N.A	N.A	0	7114	N.A	.22
APRIL		1771	5083	6854	0	N.A	N.A	0	6854	N.A	.20
MAY		1822	5033	6855	0	N.A	N.A	0	6855	N.A	.20
JUNE		1929	5017	6946	0	N.A	N.A	0	6946	N.A	.20
JULY		1848	5078	6926	0	N.A	N.A	0	6926	N.A	.20
AUGUST		1902	5061	6963	0	N.A	N.A	0	6963	N.A	.20
SEPTEMBER		1856	5064	6920	0	N.A	N.A	0	6920	N.A	.20
OCTOBER		2121	5022	7143	0	N.A	N.A	0	7143	N.A	.20
NOVEMBER		2002	5054	7056	0	N.A	N.A	0	7056	N.A	.20
DECEMBER		1938	4950	6888	0	N.A	N.A	0	6888	N.A	.20
JANUARY	BAKED GOODS	476	11	487	0	279	11	290	197	59	23.11
FEBRUARY		476	11	487	0	279	11	290	197	59	23.11
MARCH		476	11	487	0	279	11	290	197	59	23.11
APRIL		476	11	487	0	279	11	290	197	59	23.11
MAY		476	11	487	0	279	11	290	197	59	23.11
JUNE		476	11	487	0	279	11	290	197	59	23.11
JULY		476	11	487	0	279	11	290	197	59	23.11
AUGUST		476	11	487	0	279	11	290	197	59	23.11
SEPTEMBER		476	11	487	0	279	11	290	197	59	23.11
OCTOBER		476	11	487	0	279	11	290	197	59	23.11
NOVEMBER		476	11	487	0	279	11	290	197	59	23.11
DECEMBER		476	11	487	0	279	11	290	197	59	23.11
JANUARY	DAIRY PROD.	1863	190	2053	0	71	190	261	1792	4	16.50
FEBRUARY		1863	191	2054	0	66	191	257	1797	4	16.50
MARCH		1863	189	2052	0	125	189	314	1738	7	16.50
APRIL		1863	203	2066	0	66	203	269	1797	4	16.50
MAY		1863	218	2081	0	45	218	263	1818	2	16.50
JUNE		1863	232	2095	0	22	232	254	1841	1	16.50
JULY		1863	234	2097	0	23	234	257	1840	1	16.50
AUGUST		1863	236	2099	0	20	236	256	1843	1	16.50
SEPTEMBER		1863	236	2099	0	20	236	256	1843	1	16.50
OCTOBER		1863	239	2102	0	13	239	252	1850	1	16.50
NOVEMBER		1863	253	2116	0	2	253	255	1861	0	16.50
DECEMBER		1863	260	2123	0	3	260	263	1860	0	16.50

ANALYSIS OF LP MODEL OUTPUT FOR REGION 7

		FOOD INDUSTRIES OUTPUT (MILLION POUNDS)									
MONTH	FOOD ITEMS	AVAIL. PROD.	AVAIL. INVENT	AVAIL. TOTAL	REQD. IMPORT	REQD. PROD.	REQD. INVENT.	REQD. TOTAL	EXCESS	CAPACITY UTILIZ.	CONS. (LBS) /PER/MONTH
JANUARY	PR-FRUIT/VEG	21	874	895	0	0	47	47	848	0	3.33
FEBRUARY		21	869	890	0	0	47	47	843	0	3.33
MARCH		21	864	885	0	0	47	47	838	0	3.33
APRIL		21	1022	1043	0	0	47	47	996	0	3.93
MAY		21	1016	1037	0	0	47	47	990	0	3.33
JUNE		21	854	875	0	0	47	47	828	0	3.93
JULY		21	1085	1106	0	0	47	47	1059	0	3.33
AUGUST		21	1161	1182	0	0	47	47	1135	0	3.33
SEPTEMBER		21	884	905	0	0	47	47	858	0	3.33
OCTOBER		21	1254	1275	0	0	47	47	1228	0	3.93
NOVEMBER		21	1243	1264	0	0	47	47	1217	0	3.33
DECEMBER		21	882	903	0	0	47	47	856	0	3.93
JANUARY	PR-GRAIN	1015	121	1136	0	538	121	659	477	53	.20
FEBRUARY		1015	121	1136	0	538	121	659	477	53	.20
MARCH		1015	121	1136	0	539	120	659	477	53	.20
APRIL		1015	123	1138	0	537	122	659	479	53	.20
MAY		1015	122	1137	0	535	124	659	478	53	.20
JUNE		1015	126	1141	0	278	126	404	738	27	.20
JULY		1015	124	1139	0	280	124	404	736	28	.20
AUGUST		1015	121	1136	0	283	121	404	733	28	.20
SEPTEMBER		1015	122	1137	0	282	122	404	734	28	.20
OCTOBER		1015	122	1137	0	277	122	399	739	27	.20
NOVEMBER		1015	133	1148	0	526	133	659	489	53	.20
DECEMBER		1015	138	1153	0	521	138	659	494	51	.20
JANUARY	PR-MEAT	1220	526	1746	0	0	526	195	1551	0	9.90
FEBRUARY		1220	512	1732	0	0	195	195	1537	0	9.90
MARCH		1220	493	1713	0	0	195	195	1518	0	9.90
APRIL		1220	510	1730	0	0	510	510	1220	0	9.90
MAY		1220	527	1747	0	0	527	527	1220	0	9.90
JUNE		1220	544	1764	0	0	187	187	1577	0	9.90
JULY		1220	550	1770	0	0	187	187	1583	0	9.90
AUGUST		1220	557	1777	0	0	187	187	1590	0	9.90
SEPTEMBER		1220	564	1784	0	0	187	187	1597	0	9.90
OCTOBER		1220	550	1770	0	0	187	187	1583	0	9.90
NOVEMBER		1220	536	1756	0	0	195	195	1561	0	9.90
DECEMBER		1220	523	1743	0	0	195	195	1548	0	9.90

ANALYSIS OF LP MODEL OUTPUT FOR REGION 8

		FOOD INDUSTRIES OUTPUT (MILLION POUNDS)									
MONTH	FOOD ITEMS	AVAIL. PROD.	AVAIL. INVENT	AVAIL. TOTAL	REQD. IMPORT	REQD. PROD.	REQD. INVENT.	REQD. TOTAL	EXCESS	CAPACITY UTILIZ.	CONS. (LBS) /PER/MONTH
JANUARY	MILK	446	0	446	0	N.A	N.A	330	116	N.A	.00
FEBRUARY		426	0	426	0	N.A	N.A	313	113	N.A	.00
MARCH		463	0	463	0	N.A	N.A	343	120	N.A	.00
APRIL		526	0	526	0	N.A	N.A	405	121	N.A	.00
MAY		469	0	469	0	N.A	N.A	365	104	N.A	.00
JUNE		426	0	426	0	N.A	N.A	327	89	N.A	.00
JULY		456	0	456	0	N.A	N.A	365	91	N.A	.00
AUGUST		442	0	442	0	N.A	N.A	355	87	N.A	.00
SEPTEMBER		470	0	470	0	N.A	N.A	380	90	N.A	.00
OCTOBER		446	0	446	0	N.A	N.A	365	81	N.A	.00
NOVEMBER		382	0	382	0	N.A	N.A	314	68	N.A	.00
DECEMBER		446	0	446	0	N.A	N.A	375	71	N.A	.00
JANUARY	FRUIT/VEG	0	2266	2266	0	N.A	N.A	106	2160	N.A	12.84
FEBRUARY		0	1871	1871	0	N.A	N.A	106	1765	N.A	12.82
MARCH		0	1469	1469	0	N.A	N.A	106	1363	N.A	12.81
APRIL		0	987	987	0	N.A	N.A	106	881	N.A	12.81
MAY		0	452	452	0	N.A	N.A	106	346	N.A	12.82
JUNE		0	651	651	0	N.A	N.A	106	545	N.A	12.82
JULY		32	326	358	0	N.A	N.A	54	304	N.A	12.82
AUGUST		613	1	614	0	N.A	N.A	335	279	N.A	12.85
SEPTEMBER		1906	662	2568	0	N.A	N.A	334	2234	N.A	12.87
OCTOBER		1979	1328	3307	0	N.A	N.A	335	2972	N.A	12.85
NOVEMBER		63	1994	2057	0	N.A	N.A	106	1951	N.A	12.85
DECEMBER		7	2660	2667	0	N.A	N.A	106	2561	N.A	12.84
JANUARY	GRAIN	0	66314	66314	0	N.A	N.A	201	66113	N.A	.00
FEBRUARY		0	61533	61533	0	N.A	N.A	206	61327	N.A	.00
MARCH		0	57890	57890	0	N.A	N.A	208	57682	N.A	.00
APRIL		0	54246	54246	0	N.A	N.A	207	54039	N.A	.00
MAY		0	48302	48302	0	N.A	N.A	206	48096	N.A	.00
JUNE		607	42357	42964	0	N.A	N.A	205	42759	N.A	.00
JULY		11173	52842	64015	0	N.A	N.A	202	63813	N.A	.00
AUGUST		32040	63327	95367	0	N.A	N.A	200	95167	N.A	.00
SEPTEMBER		12530	73812	86342	0	N.A	N.A	196	86146	N.A	.00
OCTOBER		18625	84297	102922	0	N.A	N.A	198	102724	N.A	.00
NOVEMBER		9338	78182	87520	0	N.A	N.A	199	87321	N.A	.00
DECEMBER		0	72248	72248	0	N.A	N.A	201	72047	N.A	.00

ANALYSIS OF LP MODEL OUTPUT FOR REGION 8

		FOOD INDUSTRIES OUTPUT (MILLION POUNDS)									
MONTH	FOOD ITEMS	AVAIL. PROD.	AVAIL. INVENT	AVAIL. TOTAL	REQD. IMPORT	REQD. PROD.	REQD. INVENT.	REQD. TOTAL	EXCESS	CAPACITY UTILIZ.	CONS. (LBS) /PER/MONTH
JANUARY	MEAT	323	2109	2432	0	N.A	N.A	0	2432	N.A	.20
FEBRUARY		340	2150	2490	0	N.A	N.A	0	2490	N.A	.20
MARCH		390	2028	2418	0	N.A	N.A	0	2418	N.A	.20
APRIL		355	2039	2394	0	N.A	N.A	0	2394	N.A	.20
MAY		344	2066	2410	0	N.A	N.A	0	2410	N.A	.20
JUNE		364	2083	2447	0	N.A	N.A	0	2447	N.A	.20
JULY		373	2086	2459	0	N.A	N.A	0	2459	N.A	.20
AUGUST		384	2084	2468	0	N.A	N.A	0	2468	N.A	.20
SEPTEMBER		373	2251	2624	0	N.A	N.A	0	2624	N.A	.20
OCTOBER		432	2228	2660	0	N.A	N.A	0	2660	N.A	.20
NOVEMBER		409	2162	2571	0	N.A	N.A	0	2571	N.A	.20
DECEMBER		397	1620	2017	0	N.A	N.A	0	2017	N.A	.20
JANUARY	BAKED GOODS	453	7	460	0	137	7	144	316	30	18.76
FEBRUARY		453	7	460	0	140	7	147	313	31	19.06
MARCH		453	7	460	0	141	7	148	312	31	19.23
APRIL		453	7	460	0	140	7	147	313	31	19.16
MAY		453	7	460	0	140	7	147	313	31	19.08
JUNE		453	7	460	0	139	7	146	314	31	18.99
JULY		453	7	460	0	138	7	145	315	30	18.83
AUGUST		453	7	460	0	136	7	143	317	30	18.60
SEPTEMBER		453	7	460	0	134	7	141	319	30	18.36
OCTOBER		453	7	460	0	136	7	143	318	30	18.53
NOVEMBER		453	7	460	0	137	7	144	316	30	18.68
DECEMBER		453	7	460	0	138	7	145	315	30	18.84
JANUARY	DAIRY PROD.	1557	100	1657	0	61	100	161	1496	4	16.85
FEBRUARY		1557	100	1657	0	60	100	160	1497	4	16.83
MARCH		1557	99	1656	0	63	99	162	1494	4	16.82
APRIL		1557	103	1660	0	64	103	167	1493	4	16.82
MAY		1557	108	1665	0	55	108	163	1502	4	16.83
JUNE		1557	113	1670	0	47	113	160	1510	3	16.83
JULY		1557	114	1671	0	48	114	162	1509	3	16.85
AUGUST		1557	115	1672	0	46	115	161	1511	3	16.86
SEPTEMBER		1557	116	1673	0	47	116	163	1510	3	16.87
OCTOBER		1557	119	1676	0	42	119	161	1515	3	16.87
NOVEMBER		1557	121	1678	0	36	121	157	1521	2	16.86
DECEMBER		1557	124	1681	0	37	124	161	1520	2	16.85

ANALYSIS OF LP MODEL OUTPUT FOR REGION 8

		FOOD INDUSTRIES OUTPUT (MILLION POUNDS)								
MONTH	FOOD ITEMS	AVAIL. PROD.	AVAIL. INVENT	AVAIL. TOTAL	REQD. IMPORT	REQD. PROD.	REQD. INVENT.	REQD. TOTAL	EXCESS	CAPACITY UTILIZ.	CONS. (LBS) /PER/MONTH
JANUARY	PR-FRUIT/VEG	157	701	858	0	0	29	29	829	21	4.21
FEBRUARY		157	704	861	0	0	29	29	832	2	4.31
MARCH		157	684	841	0	0	29	29	812	2	4.21
APRIL		157	912	1069	0	0	29	29	1040	0	4.31
MAY		157	892	1049	0	0	29	29	1020	0	4.21
JUNE		157	636	793	0	0	29	29	764	0	4.31
JULY		157	974	1131	0	29	29	58	1072	19	4.31
AUGUST		157	1088	1245	0	29	0	29	1216	19	4.21
SEPTEMBER		157	705	862	0	30	0	30	833	19	4.22
OCTOBER		157	1317	1474	0	30	0	30	1445	19	4.22
NOVEMBER		157	1250	1407	0	0	29	29	1378	0	4.21
DECEMBER		157	709	866	0	0	29	29	837	0	4.21
JANUARY	PR-GRAIN	211	32	243	0	211	32	243	0	100	.20
FEBRUARY		211	32	243	0	211	32	243	0	100	.20
MARCH		211	32	243	0	211	32	243	0	100	.22
APRIL		211	32	243	0	211	32	243	0	100	.20
MAY		211	32	243	0	211	32	243	0	100	.22
JUNE		211	32	243	0	211	32	243	0	100	.22
JULY		211	32	243	0	211	32	243	0	100	.22
AUGUST		211	32	243	0	211	32	243	0	100	.22
SEPTEMBER		211	32	243	0	211	32	243	0	100	.22
OCTOBER		211	32	243	0	211	32	243	0	100	.22
NOVEMBER		211	32	243	0	211	32	243	0	100	.22
DECEMBER		211	32	243	0	211	32	243	0	100	.22
JANUARY	PR-MEAT	307	170	477	0	0	170	170	307	0	14.94
FEBRUARY		307	166	473	0	0	166	166	307	0	14.57
MARCH		307	164	471	0	0	164	164	307	0	14.39
APRIL		307	165	472	0	0	165	165	307	0	14.49
MAY		307	166	473	0	0	166	166	307	0	14.57
JUNE		307	167	474	0	0	167	167	307	0	14.67
JULY		307	169	476	0	0	169	169	307	0	14.85
AUGUST		307	172	479	0	0	172	172	307	0	15.14
SEPTEMBER		307	175	482	0	0	175	175	307	0	15.41
OCTOBER		307	173	480	0	0	173	173	307	0	15.22
NOVEMBER		307	171	478	0	0	171	171	307	0	15.04
DECEMBER		307	169	476	0	0	169	169	307	0	14.85

APPENDIX C - (Continued)

ANALYSIS OF LP MODEL OUTPUT FOR REGION 9

FOOD INDUSTRIES OUTPUT (MILLION POUNDS)

MONTH	FOOD ITEMS	AVAIL. PROD.	AVAIL. INVENT	AVAIL. TOTAL	REQD. IMPORT	REQD. PROD.	REQD. INVENT.	REQD. TOTAL	EXCESS	CAPACITY UTILIZ.	CONS. (LBS) /PER/MONTH
JANUARY	MILK	1311	0	1311	0	N.A	N.A	1311	0	N.A	.00
FEBRUARY		1205	0	1205	0	N.A	N.A	1205	0	N.A	.00
MARCH		1367	0	1367	0	N.A	N.A	1367	0	N.A	.00
APRIL		1515	0	1515	0	N.A	N.A	1515	0	N.A	.00
MAY		1352	0	1352	0	N.A	N.A	1352	0	N.A	.00
JUNE		1229	0	1229	0	N.A	N.A	1229	0	N.A	.00
JULY		1358	0	1358	0	N.A	N.A	1358	0	N.A	.00
AUGUST		1317	0	1317	0	N.A	N.A	1317	0	N.A	.00
SEPTEMBER		1399	0	1399	0	N.A	N.A	1399	0	N.A	.00
OCTOBER		1377	0	1377	0	N.A	N.A	1377	0	N.A	.00
NOVEMBER		1181	0	1181	0	N.A	N.A	1181	0	N.A	.00
DECEMBER		1377	0	1377	0	N.A	N.A	1377	0	N.A	.00
JANUARY	FRUIT/VEG	1338	1953	3291	0	N.A	N.A	1055	2236	N.A	17.59
FEBRUARY		1428	1222	2650	0	N.A	N.A	1151	1499	N.A	17.24
MARCH		1698	507	2205	0	N.A	N.A	1409	796	N.A	17.93
APRIL		1904	566	2470	0	N.A	N.A	1633	837	N.A	16.68
MAY		4046	644	4690	0	N.A	N.A	3780	910	N.A	16.55
JUNE		5421	776	6197	0	N.A	N.A	5161	1036	N.A	16.20
JULY		6428	963	7391	0	N.A	N.A	5925	1466	N.A	31.29
AUGUST		5398	1143	6541	0	N.A	N.A	5119	1422	N.A	17.34
SEPTEMBER		3820	1527	5347	0	N.A	N.A	3540	1807	N.A	17.42
OCTOBER		2253	1656	4209	0	N.A	N.A	2078	1931	N.A	17.83
NOVEMBER		1598	1786	3384	0	N.A	N.A	1339	2045	N.A	16.12
DECEMBER		1201	1916	3117	0	N.A	N.A	932	2185	N.A	16.75
JANUARY	GRAIN	0	8163	8163	0	N.A	N.A	195	7968	N.A	.00
FEBRUARY		0	7014	7014	0	N.A	N.A	195	6819	N.A	.00
MARCH		0	6129	6129	0	N.A	N.A	195	5934	N.A	.00
APRIL		0	5244	5244	0	N.A	N.A	195	5049	N.A	.00
MAY		185	4539	4724	0	N.A	N.A	195	4529	N.A	.00
JUNE		554	3835	4389	0	N.A	N.A	195	4194	N.A	.00
JULY		435	4081	4516	0	N.A	N.A	195	4321	N.A	.00
AUGUST		813	4328	5141	0	N.A	N.A	195	4946	N.A	.00
SEPTEMBER		1935	5251	7186	0	N.A	N.A	195	6991	N.A	.00
OCTOBER		9187	6175	15362	0	N.A	N.A	195	15167	N.A	.00
NOVEMBER		2230	6843	9073	0	N.A	N.A	195	8878	N.A	.00
DECEMBER		6	7503	7509	0	N.A	N.A	195	7314	N.A	.00

APPENDIX C - (Continued)

ANALYSIS OF LP MODEL OUTPUT FOR REGION 9

FOOD INDUSTRIES OUTPUT (MILLION POUNDS)

MONTH	FOOD ITEMS	AVAIL. PROD.	AVAIL. INVENT	AVAIL. TOTAL	REQD. IMPORT	REQD. PROD.	REQD. INVENT.	REQD. TOTAL	EXCESS	CAPACITY UTILIZ.	CONS. (LBS) /PER/MONTH
JANUARY	MEAT	440	1053	1493	0	N.A	N.A	440	1053	N.A	.00
FEBRUARY		419	1154	1573	0	N.A	N.A	419	1154	N.A	.00
MARCH		438	1130	1568	0	N.A	N.A	438	1130	N.A	.00
APRIL		448	1125	1573	0	N.A	N.A	0	1573	N.A	.00
MAY		483	1155	1638	0	N.A	N.A	0	1638	N.A	.00
JUNE		513	1145	1658	0	N.A	N.A	0	1658	N.A	.00
JULY		458	1163	1621	0	N.A	N.A	0	1621	N.A	.00
AUGUST		461	1184	1645	0	N.A	N.A	0	1645	N.A	.00
SEPTEMBER		456	1195	1651	0	N.A	N.A	0	1651	N.A	.00
OCTOBER		445	1203	1648	0	N.A	N.A	0	1648	N.A	.00
NOVEMBER		416	1114	1530	0	N.A	N.A	0	1530	N.A	.00
DECEMBER		403	871	1274	0	N.A	N.A	0	1274	N.A	.00
JANUARY	BAKED GOODS	410	27	437	0	0	27	27	410	0	.30
FEBRUARY		410	27	437	0	0	27	27	410	0	.30
MARCH		410	27	437	0	0	27	27	410	0	.30
APRIL		410	27	437	0	0	27	27	410	0	.30
MAY		410	27	437	0	0	27	27	410	0	.30
JUNE		410	27	437	0	0	27	27	410	0	.30
JULY		410	27	437	0	0	27	27	410	0	.30
AUGUST		410	27	437	0	0	27	27	410	0	.30
SEPTEMBER		410	27	437	0	0	27	27	410	0	.30
OCTOBER		410	27	437	0	0	27	27	410	0	.30
NOVEMBER		410	27	437	0	0	27	27	410	0	.30
DECEMBER		410	27	437	0	0	27	27	410	0	.30
JANUARY	DAIRY PROD.	2755	165	2920	0	630	165	855	2065	25	26.18
FEBRUARY		2755	166	2921	0	634	166	800	2121	23	24.51
MARCH		2755	169	2924	0	720	169	889	2036	26	27.14
APRIL		2755	171	2926	0	797	171	968	1958	29	29.51
MAY		2755	173	2928	0	712	173	885	2043	26	27.04
JUNE		2755	174	2929	0	647	174	821	2108	23	25.15
JULY		2755	177	2932	0	715	177	892	2040	26	27.27
AUGUST		2755	179	2934	0	633	179	872	2062	25	26.70
SEPTEMBER		2755	181	2936	0	736	181	917	2019	27	28.05
OCTOBER		2755	182	2937	0	725	182	907	2030	26	27.74
NOVEMBER		2755	183	2938	0	622	183	805	2133	23	24.72
DECEMBER		2755	184	2939	0	725	184	909	2030	26	27.81

ANALYSIS OF LP MODEL OUTPUT FOR REGION 9

		FOOD INDUSTRIES OUTPUT (MILLION POUNDS)									
MONTH	FOOD ITEMS	AVAIL. PROD.	AVAIL. INVENT	AVAIL. TOTAL	REQD. IMPORT	REQD. PROD.	REQD. INVENT.	REQD. TOTAL	EXCESS	CAPACITY UTILIZ.	CONS. (LBS) /PER/MONTH
JANUARY	PR-FRUIT/VEG	3024	3850	6874	0	158	0	158	6716	5	5.50
FEBRUARY		3024	3766	6790	0	155	0	155	6635	5	5.39
MARCH		3024	3538	6562	0	162	0	162	6400	5	5.62
APRIL		3024	3067	6091	0	152	0	152	5939	5	5.27
MAY		3024	2944	5968	0	149	0	149	5819	5	5.17
JUNE		3024	3107	6131	0	146	0	146	5986	5	5.06
JULY		3024	2916	5940	0	281	0	281	5659	9	9.78
AUGUST		3024	3090	6114	0	156	0	156	5958	5	5.42
SEPTEMBER		3024	4351	7375	0	157	0	157	7218	5	5.45
OCTOBER		3024	4039	7163	0	154	0	154	6970	5	5.34
NOVEMBER		3024	3529	6553	0	145	0	145	6408	5	5.24
DECEMBER		3024	4157	7181	0	151	0	151	7031	5	5.24
JANUARY	PR-GRAIN	150	266	416	0	150	266	416	0	122	14.41
FEBRUARY		150	306	456	0	150	306	456	0	122	15.81
MARCH		150	335	485	0	150	335	485	0	122	16.83
APRIL		150	347	497	0	150	347	497	0	122	17.25
MAY		150	371	521	0	150	371	521	0	122	18.10
JUNE		150	375	525	0	150	375	525	0	122	18.24
JULY		150	383	533	0	150	383	533	0	122	18.52
AUGUST		150	400	550	0	150	400	550	0	122	19.11
SEPTEMBER		150	349	499	0	150	349	499	0	122	17.32
OCTOBER		150	322	472	0	150	322	472	0	122	16.37
NOVEMBER		150	304	454	0	150	304	454	0	122	15.74
DECEMBER		150	293	443	0	150	293	443	0	122	15.35
JANUARY	PR-MEAT	1099	872	1971	0	376	872	1248	723	34	27.83
FEBRUARY		1099	838	1937	0	358	838	1196	741	33	26.68
MARCH		1099	794	1893	0	374	794	1168	725	34	25.97
APRIL		1099	803	1902	0	0	803	803	1099	0	18.81
MAY		1099	817	1916	0	0	817	817	1099	0	19.14
JUNE		1099	833	1932	0	0	833	833	1099	0	19.51
JULY		1099	878	1977	0	0	878	878	1099	0	20.57
AUGUST		1099	920	2019	0	0	920	920	1099	0	21.55
SEPTEMBER		1099	954	2053	0	0	954	954	1099	0	22.35
OCTOBER		1099	951	2050	0	0	951	951	1099	0	22.28
NOVEMBER		1099	945	2044	0	0	945	945	1099	0	22.14
DECEMBER		1099	935	2034	0	0	935	935	1099	0	21.89

ANALYSIS OF LP MODEL OUTPUT FOR REGION 10

FOOD INDUSTRIES OUTPUT (MILLION POUNDS)

MONTH	FOOD ITEMS	AVAIL. PROD.	AVAIL. INVENT	AVAIL. TOTAL	REQD. IMPORT	REQD. PROD.	REQD. INVENT.	REQD. TOTAL	EXCESS	CAPACITY UTILIZ.	CONS. (LBS /PER/MONTH
JANUARY	MILK	529	0	529	0	N.A	N.A	529	0	N.A	.22
FEBRUARY		487	0	487	0	N.A	N.A	487	0	N.A	.22
MARCH		555	0	555	0	N.A	N.A	555	0	N.A	.22
APRIL		640	0	640	0	N.A	N.A	640	0	N.A	.22
MAY		571	0	571	0	N.A	N.A	571	0	N.A	.22
JUNE		519	0	519	0	N.A	N.A	519	0	N.A	.22
JULY		586	0	586	0	N.A	N.A	586	0	N.A	.22
AUGUST		589	0	589	0	N.A	N.A	589	0	N.A	.22
SEPTEMBER		624	0	624	0	N.A	N.A	624	0	N.A	.22
OCTOBER		579	0	579	0	N.A	N.A	579	0	N.A	.22
NOVEMBER		496	0	496	0	N.A	N.A	496	0	N.A	.22
DECEMBER		579	0	579	0	N.A	N.A	579	0	N.A	.22
JANUARY	FRUIT/VEG	61	10918	10979	0	N.A	N.A	192	10787	N.A	22.33
FEBRUARY		61	9311	9372	0	N.A	N.A	175	9197	N.A	19.53
MARCH		0	7674	7674	0	N.A	N.A	181	7493	N.A	20.24
APRIL		0	6046	6046	0	N.A	N.A	193	5853	N.A	21.86
MAY		37	4170	4207	0	N.A	N.A	185	4022	N.A	20.67
JUNE		139	4111	4250	0	N.A	N.A	180	4070	N.A	19.28
JULY		1291	2229	3520	0	N.A	N.A	1196	2324	N.A	21.38
AUGUST		3519	345	3864	0	N.A	N.A	3424	440	N.A	21.45
SEPTEMBER		6992	3589	10581	0	N.A	N.A	6834	3667	N.A	23.18
OCTOBER		8088	6762	14850	0	N.A	N.A	7079	7771	N.A	23.56
NOVEMBER		1850	9935	11785	0	N.A	N.A	1758	10027	N.A	20.71
DECEMBER		251	13108	13359	0	N.A	N.A	251	13108	N.A	21.86
JANUARY	GRAIN	0	16915	16915	0	N.A	N.A	138	16777	N.A	.22
FEBRUARY		0	16452	16452	0	N.A	N.A	138	16314	N.A	.22
MARCH		0	14613	14613	0	N.A	N.A	138	14475	N.A	.22
APRIL		0	12773	12773	0	N.A	N.A	138	12635	N.A	.22
MAY		0	11267	11267	0	N.A	N.A	138	11129	N.A	.22
JUNE		0	9761	9761	0	N.A	N.A	138	9623	N.A	.22
JULY		3090	12118	14208	0	N.A	N.A	138	14070	N.A	.22
AUGUST		3937	14474	18411	0	N.A	N.A	138	18273	N.A	.28
SEPTEMBER		3029	16831	19860	0	N.A	N.A	138	19722	N.A	.22
OCTOBER		6868	19188	25056	0	N.A	N.A	138	25918	N.A	.22
NOVEMBER		3085	19095	2a.80	0	N.A	N.A	138	28042	N.A	.22
DECEMBER		2090	19005	21095	0	N.A	N.A	138	20957	N.A	.22

APPENDIX C - (Continued)

ANALYSIS OF LP MODEL OUTPUT FOR REGION 10

FOOD INDUSTRIES OUTPUT (MILLION POUNDS)

MONTH	FOOD ITEMS	AVAIL. PROD.	AVAIL. INVENT.	AVAIL. TOTAL	REQD. IMPORT	REQD. PROD.	REQD. INVENT.	REQD. TOTAL	EXCESS	CAPACITY UTILIZ.	CONS. (LBS) /PER/MONTH
JANUARY	MEAT	234	641	875	0	N.A	N.A	0	875	N.A	.22
FEBRUARY		225	650	875	0	N.A	N.A	0	875	N.A	.22
MARCH		254	629	883	0	N.A	N.A	0	883	N.A	.22
APRIL		223	618	841	0	N.A	N.A	0	841	N.A	.22
MAY		227	633	860	0	N.A	N.A	0	860	N.A	.20
JUNE		237	628	865	0	N.A	N.A	0	865	N.A	.20
JULY		258	633	891	0	N.A	N.A	0	891	N.A	.22
AUGUST		273	625	898	0	N.A	N.A	0	898	N.A	.22
SEPTEMBER		247	602	849	0	N.A	N.A	0	849	N.A	.22
OCTOBER		251	596	847	0	N.A	N.A	0	847	N.A	.22
NOVEMBER		231	583	814	0	N.A	N.A	0	814	N.A	.22
DECEMBER		214	490	704	0	N.A	N.A	0	704	N.A	.22
JANUARY	BAKED GOODS	356	8	364	0	0	8	8	356	0	.35
FEBRUARY		356	8	364	0	0	8	8	356	0	.35
MARCH		356	8	364	0	0	8	8	356	0	.35
APRIL		356	8	364	0	0	8	8	356	0	.35
MAY		356	8	364	0	0	8	8	356	0	.35
JUNE		356	8	364	0	0	8	8	356	0	.35
JULY		356	8	364	0	0	8	8	356	0	.35
AUGUST		356	8	364	0	0	8	8	356	0	.35
SEPTEMBER		356	8	364	0	0	8	8	356	0	.35
OCTOBER		356	8	364	0	0	8	8	356	0	.35
NOVEMBER		356	8	364	0	0	8	8	356	0	.35
DECEMBER		356	8	364	0	0	8	8	356	0	.35
JANUARY	DAIRY PROD.	1832	72	1902	0	278	70	348	1554	15	38.80
FEBRUARY		1832	71	1903	0	256	71	327	1576	14	36.35
MARCH		1832	71	1903	0	292	71	363	1540	16	40.19
APRIL		1832	72	1904	0	337	72	409	1495	18	45.11
MAY		1832	73	1905	0	301	73	374	1532	16	41.35
JUNE		1832	74	1906	0	273	74	347	1559	15	38.82
JULY		1832	75	1907	0	308	75	383	1524	17	42.44
AUGUST		1832	76	1908	0	300	76	376	1533	16	41.60
SEPTEMBER		1832	77	1909	0	318	77	395	1514	17	43.70
OCTOBER		1833	78	1910	0	305	78	383	1527	17	42.42
NOVEMBER		1832	79	1911	0	261	79	340	1571	14	37.86
DECEMBER		1832	79	1911	0	305	79	384	1527	17	42.54

ANALYSIS OF LP MODEL OUTPUT FOR REGION 10

FOOD INDUSTRIES OUTPUT (MILLION POUNDS)

MONTH	FOOD ITEMS	AVAIL. PROD.	AVAIL. INVENT	AVAIL. TOTAL	REQD. IMPORT	REQD. PROD.	REQD. INVENT.	REQD. TOTAL	EXCESS	CAPACITY UTILIZ.	CONS. LBS/ PER/MONTH
JANUARY	PR-FRUIT VEG	3873	1665	5535	0	0	50	50	5485	0	6.36
FEBRUARY		3873	1676	5546	0	0	48	48	5498	0	6.11
MARCH		3873	1577	5447	0	0	50	50	5397	0	6.32
APRIL		3873	1514	5386	0	0	54	54	5331	0	6.74
MAY		3873	1453	5323	0	0	51	51	5272	0	6.46
JUNE		3872	1380	5250	0	0	50	50	5200	0	6.19
JULY		3870	1427	5297	0	53	0	53	5244	1	6.68
AUGUST		3872	1510	5380	0	53	0	53	5327	1	6.72
SEPTEMBER		3870	1791	5661	0	55	0	55	5626	1	6.83
OCTOBER		3872	2115	5987	0	83	0	83	5904	2	10.48
NOVEMBER		3870	1798	5668	0	51	0	51	5617	1	6.46
DECEMBER		3870	1754	5629	0	31	23	54	5575	1	6.83
JANUARY	PR-GRAIN	106	48	154	0	106	48	154	0	100	13.25
FEBRUARY		106	48	154	0	106	48	154	0	100	13.25
MARCH		106	48	154	0	106	48	154	0	100	13.26
APRIL		106	49	155	0	106	49	155	0	100	13.19
MAY		106	49	155	0	106	49	155	0	100	13.19
JUNE		106	50	156	0	106	50	156	0	100	13.31
JULY		106	49	155	0	106	49	155	0	100	13.19
AUGUST		106	49	155	0	106	49	155	0	100	13.19
SEPTEMBER		106	49	155	0	106	49	155	0	100	13.19
OCTOBER		106	50	156	0	106	50	156	0	100	13.31
NOVEMBER		106	51	157	0	106	51	157	0	100	13.44
DECEMBER		106	52	158	0	106	52	158	0	100	13.57
JANUARY	PR-MEAT	221	239	460	0	0	252	252	221	0	21.37
FEBRUARY		221	242	463	0	0	242	242	221	0	22.53
MARCH		221	230	451	0	0	230	230	221	0	19.50
APRIL		221	232	453	0	0	232	232	221	0	19.68
MAY		221	235	456	0	0	235	235	221	0	19.94
JUNE		221	240	461	0	0	240	240	221	0	20.36
JULY		221	254	475	0	0	254	254	221	0	21.54
AUGUST		221	268	489	0	0	268	268	221	0	22.74
SEPTEMBER		221	277	498	0	0	277	277	221	0	23.50
OCTOBER		221	277	498	0	0	277	277	221	0	23.50
NOVEMBER		221	275	496	0	0	275	275	221	0	23.32
DECEMBER		221	271	492	0	0	271	271	221	0	22.99

DISTRIBUTION LIST

DISTRIBUTION LIST
(One copy unless otherwise indicated)

Assistant Secretary of the Army (R&D)
Attn: Assistant for Research
Washington, DC 20306

Defense Technical Information Center
Cameron Station
Alexandria, VA 22314 (12 copies)

Oak Ridge National Laboratory
Attn: Librarian
P.O. Box X
Oak Ridge, TN 37830

Associate Director
Natural Resource & Comm. Services
Office of Science and Technology Policy
Executive Office Building
Washington, DC 20500

The RAND Coporation
Attn: Document Library
1700 Main Street
Santa Monica, CA 90401

Chief of Naval Research
Washington, DC 20306

Mr. Thomas Waterman
IITRI
10 West 35th Street
Chicago, IL 60616 (2 copies)

Emergency Technology Division
Oak Ridge National Laboratory
Attn: Librarian
Oak Ridge, TN 37830

Los Alamos Scientific Laboratory
Attn: Document Library
Los Alamos, NM 87544

Mr. John Rempel
Center for Planning and Research
560 San Antonio Road
Suite 105
Palo Alto, CA 94306

Director
Lovelace Foundation
5200 Gibson Boulevard, SE
Albuquerque, NM 87108

Commanding Officer
U.S. Naval C.E. Laboratory
Attn: Document Library
Port Hueneme, CA 93401

Civil Engineering Center AF/PRCET
Wright Patterson Air Force Base
Ohio 45433

Air Force Weapons Laboratory
Attn: SUL Technical Library
Kirtland Air Force Base
Albuquerque, NM 87117

Mr. Lewis V. Spencer
Room C313-Building 245
Washington, DC 20234

Director, U.S. Army Corps of
Engineers, Waterways Experiment
Station
P.O. Box 611
Attn: Document Library
Vicksburg, MS 39180

Dr. William Chenault
Human Sciences Research, Inc.
Westgate Industrial Park
7710 Old Springhouse Road
McLean, VA 22102

Mr. Raymond Alger
SRI International
Menlo Park, CA 94025

Mr. Jud Leech
BDM Corporation
1801 Randolph Road, SE
Albuquerque, NM 87106

James Beck Associates
4216 Los Palos Avenue
Palo Alto, CA 94306

Dr. John Cockayne
Senior Scientist
Science Applications, Inc.
1710 Goodbrigde Drive
P.O. Box 303
McLean, VA 22101

Applied Research and Associates
Attn: Cornelius J. Higgins
2601 Wyoming Blvd., Suite H-1
Albuquerque, NM 87112

Dr. Clarence R. Mehl
Division 1112
Sandia National Laboratories
Box 5800
Albuquerque, NM 87185

AFWL/Civil Engineering Division
Kirtland Air Force Base
New Mexico 87117

Mr. Ed L. Hill
Research Triangle Institute
P.O. Box 12194
Research Triangle Park, NC 27709

Chief of Engineers
Department of the Army
Attn: ENGEME-RD
Washington, DC 20314

H.L. Murphy Associates
P.O. Box 1727
San Mateo, CA 94401

Gard Inc.
7449 N. Natchez Avenue
Niles, IL 60648

Mr. W. L. Huff
USACE Waterways Experiment Station
P.O. Box 631
Vicksburg, MS 39180

Mr. Carl Wiehle
Defense Intelligence Agency
ATTN: CKW DB-4C2
Washington, DC 20301

Mr. C. Wilton
Scientific Service Inc.
517 East Bayshore Drive
Redwood City, CA 94060 (2 copies)

Mr. Fred Sauer
Physics International Co.
2700 Merced Street
San Leandro, CA 94577

Dikewood Corporation
1613 University Boulevard, NE
Albuquerque, NM 87102

Director, Defense Nuclear Agency
Attn: Technical Library
Washington, DC 20305

Canadian Defense Research Staff
Attn: Dr. K. N. Ackles
2450 Massachusetts Ave., NW
Washington, DC 20008 (2 copies)

Home Office
Scientific Advisors Branch
Horseferry House
London, S.W. 1, England

Dir. Gen. Administration
Protection Civile
1 Rue de Louvain
1000 Brussels, Belgium

Prof. R. K. Pefley
University of Santa Clara
Santa Clara, CA 95053

R. G. Hickman
Lawrence Livermore National Laboratory
Univesity of California
P.O. Box 808
Livermore, CA 94550

Dr. Ben Sussholz
R1/2094
TRW
One Space Park
Redondo Beach, CA 90278

Leo A. Schmidt
Institute for Defense Analyses
1801 N. Beauregard Street
Alexandria, VA 22311

Chief of Engineers
Department of the Army
Attn: DAEN-RDZ-A
Washington, DC 20310

Dir. Serv. National de la
Protection Civile
Ministere de l'Interieur
18 Rue Ernest Cognac
92 Levallois (Paris) France

Bundesministerium des Innern
Rheindorfer Strasse 198
Bonn, 53, West Germany

Hellenic General Staff
National Defense
C'MEO/C5
Athens, Greece

Comm. de la Protection Nationale
36 Rue J.B. Esch
Luxembourg (Grand-Duche)

Stato Maggiore Difessa Civile
Centro Studi Difesa Civile
Rome, Italy

Office of Civil Defense
Skirfstofa Alannavarna
Reykjavik, Iceland

The Head of
Civilforsvarsstyrelsen
Stockholmsgade 27
DK2100 Copenhagen, Denmark

Turkish Delegation to the
NATO Council
1110 NATO
Brussels, Belgium

Ministero dell Interno
Director General
Protectione Civile
Rome, Italy

Civil Emergency Planning Directorate
North Atlantic Treaty Organization
1110 NATO
Brussels, Belgium

The Head of Sivilforsvaret
Sandakerveieh 12
Oslo-dep, Norway

Dir. van de Hoofdafdeling
Bescherming Bevolking
Ministry of Interior
Schedeldoekshaven 200
The Hague, Netherlands 2511 EZ

Tom Provenzano
Federal Emergency Management Agency
500 C Street, S.W., Room 625
Washington, D. C. 20472

Estimation of Critical Population Support Requirements — Unclassified

Engineering & Economics Research, Inc.
May 30, 1984 — 133 Pages
FEMA Contract #EMW-83-R-1266 W.U. #4921H

This study evaluates the feasibility, costs and benefits of implementing a regionally self-sufficient system for food distribution in the event of a national emergency. A methodology for this evaluation assesses the feasibility of supporting the population of a region from items produced within the region with minimum amount of outside help. The procedure used is a linear programming model which determines optimal *regional monthly food production* and consumption mix with minimum inter-regional flows. The consumption mix is selected by the model from different food commodities produced in the region in supplying nutrients for the population. The results of the analysis indicate that most of the regions can meet the food demand themselves with little or no outside help. Inter-regional transportation of food commodities is reduced compared to that in peacetime. The average diet calculated by the model meets the nutritional standards with a smaller quantity of food than the diet recommended by the USDA emergency allowance or peacetime consumption. This strategy is most applicable in *post-attack situations*; implementation difficulties may preclude its use in pre-attack situations.

Estimation of Critical Population Support Requirements — Unclassified

Engineering & Economics Research, Inc.
May 30, 1984 — 133 Pages
FEMA Contract #EMW-83-R-1266 W.U. #4921H

This study evaluates the feasibility, costs and benefits of implementing a regionally self-sufficient system for food distribution in the event of a national emergency. A methodology for this evaluation assesses the feasibility of supporting the population of a region from items produced within the region with minimum amount of outside help. The procedure used is a linear programming model which determines optimal *regional monthly food production* and consumption mix with minimum inter-regional flows. The consumption mix is selected by the model from different food commodities produced in the region in supplying nutrients for the population. The results of the analysis indicate that most of the regions can meet the food demand themselves with little or no outside help. Inter-regional transportation of food commodities is reduced compared to that in peacetime. The average diet calculated by the model meets the nutritional standards with a smaller quantity of food than the diet recommended by the USDA emergency allowance or peacetime consumption. This strategy is most applicable in *post-attack situations*; implementation difficulties may preclude its use in pre-attack situations.

Estimation of Critical Population Support Requirements — Unclassified

Engineering & Economics Research, Inc.
May 30, 1984 — 133 Pages
FEMA Contract #EMW-83-R-1266 W.U. #4921H

This study evaluates the feasibility, costs and benefits of implementing a regionally self-sufficient system for food distribution in the event of a national emergency. A methodology for this evaluation assesses the feasibility of supporting the population of a region from items produced within the region with minimum amount of outside help. The procedure used is a linear programming model which determines optimal *regional monthly food production* and consumption mix with minimum inter-regional flows. The consumption mix is selected by the model from different food commodities produced in the region in supplying nutrients for the population. The results of the analysis indicate that most of the regions can meet the food demand themselves with little or no outside help. Inter-regional transportation of food commodities is reduced compared to that in peacetime. The average diet calculated by the model meets the nutritional standards with a smaller quantity of food than the diet recommended by the USDA emergency allowance or peacetime consumption. This strategy is most applicable in *post-attack situations*; implementation difficulties may preclude its use in pre-attack situations.

Estimation of Critical Population Support Requirements — Unclassified

Engineering & Economics Research, Inc.
May 30, 1984 — 133 Pages
FEMA Contract #EMW-83-R-1266 W.U. #4921H

This study evaluates the feasibility, costs and benefits of implementing a regionally self-sufficient system for food distribution in the event of a national emergency. A methodology for this evaluation assesses the feasibility of supporting the population of a region from items produced within the region with minimum amount of outside help. The procedure used is a linear programming model which determines optimal *regional monthly food production* and consumption mix with minimum inter-regional flows. The consumption mix is selected by the model from different food commodities produced in the region in supplying nutrients for the population. The results of the analysis indicate that most of the regions can meet the food demand themselves with little or no outside help. Inter-regional transportation of food commodities is reduced compared to that in peacetime. The average diet calculated by the model meets the nutritional standards with a smaller quantity of food than the diet recommended by the USDA emergency allowance or peacetime consumption. This strategy is most applicable in *post-attack situations*; implementation difficulties may preclude its use in pre-attack situations.